THE AMERICAN STOMATOLOGICAL ASSOCIATION

Historical Sketch

EDWARD FRANKEL, JR., M.D., F.A.C.S., *President*
New York City

Prior to 1922, Dr. John Lawrence Kelly (D. M. D., University of Minnesota, 1899), an established dental practitioner of New York City, who had practised dentistry in St. Paul for eight years, in Chicago for six years, and in New York for nine years, having been frequently approached by several younger members of the dental profession for consultation on various phases of dental practice, offered to give to a selected group once a month instruction in dental diagnosis, pyorrhoea, reconstruction, and other important dental topics, provided that a class of six would be formed. Such a dental group having been organized, consisting of Drs. Stanley Slocum, Joseph C. Ruggier, George W. Shera, Alfred J. Asgis, Frank W. McDonald, and Rex T. Taylor, the first class-meeting was held in October, 1922, at Dr. Kelly's office, 33 West 42nd Street, New York City. Thereafter meetings were regularly attended about once a month for a period of two years, Dr. Slocum presiding the first year and Dr. Asgis the second. During this period, members of the class attended a course in bacteriology at Bellevue Hospital under Drs. William H. Park and Charles Krumwiede. A correspondence course in public health was taken by some of the class. Subsequently, dental clinics by the class were given at the Midtown Hospital under Dr. Kelly's direction.

In December, 1923, the first number of *The Review of Clinical Stomatology* was issued under the editorship of Dr. Alfred J. Asgis, and published by Dr. George W. Mackenzie, Philadelphia. The original group styled themselves "The New York Stomatological Society." Having decided to include physicians in the membership, the Society, on October 9, 1924, was organized under the title: "The American Stomatological Association." A number of medical men were added to the group, and the following officers elected for 1924–1925: *Presi-*

dent, Homer E. Smith, M.D. *First Vice-President*, Oliver T. Osborne, M.D. *Second Vice-President*, N. Philip Norman, M.D. *Treasurer*, Robert Hugh Rose, M.D. *Secretary*, Alfred J. Asgis, D.D.S. During 1924–1925, correspondence with "l'Association Stomatologique Internationale" was conducted. In June, 1925, responding to an invitation, a committee of three members consisting of Dr. Alfred J. Asgis, New York, Dr. Ferdearle J. Fisher, Trenton, N. J., and Dr. Elmer E. Chambers, Warren, Ohio, visited France, Germany, Italy, Belgium and Hungary. As a token of appreciation of the pioneer work achieved by the American Stomatological Association toward the advancement of the science of stomatology, a 17th-century parchment was presented to the Association through its educational committee by medical and stomatological societies of Italy, at Rome, in June, 1925.

Dr. Weston D. Bayley, Philadelphia, was elected President for 1925–1926. In 1925 the American Stomatological Association was incorporated under the laws of the State of New York, and a charter was granted for the establishment of a school. After the first year about four meetings a year were held. Dr. George Reese Satterlee, New York, was elected president in 1926, which office he occupied at the time of his death in 1928. In November, 1926, Dr. Alfred J. Asgis resigned as Secretary of the Association. On June 24, 1927, Dr. Asgis resigned his membership in the Association, thereby severing all further connection with its activities. Since then, Dr. Asgis has organized another society of somewhat similar title, known as "The American Society of Stomatologists," which organization is entirely separate and distinct from the American Stomatological Association.

In the fall of 1927, under Dr. Satterlee's regime, and following Dr. Asgis' resignation, a Council consisting of six Fellows was created for the purpose of supervising the affairs of the Association. These six Fellows, all holding life membership, were George Reese Satterlee, M.D., Robert Hugh Rose, M.D., Redford Kohlsaat Johnson, M.D., Edward Frankel, Jr., M.D., Irving Wilson Voorhees, M.D., and John Lawrence Kelly, D.M.D., all of New York. Dr. Frankel was chosen Director of the activities of the Association, which position he continues to hold. The following officers were elected for 1927–1928: *President*, George R. Satterlee, M.D., New York. *Vice-Presidents*, John B. Deaver, M.D., Philadelphia; George W. Mackenzie, M.D.,

Philadelphia; Charles H. Mayo, M.D., Rochester, Minnesota; and Oliver T. Osborne, M.D., New Haven, Conn. *Treasurer*, Robert H. Rose, M.D., New York. *Secretary*, Edward Frankel, Jr., M.D., New York.

On December 27, 1927, following a dinner at the Columbia University Club, 4 West 43rd Street, New York City, Mills Sturtevant, M.D., New York, read a paper on "Stomatology in relation to internal medicine." John Lawrence Kelly, D.M.D., New York, presented a paper on "The need of stomatology from the standpoint of the dentist." Howard Stewart, D.D.S., New York, discussed Dr. Kelly's paper. Other discussants of these two papers were Laurance D. Redway, M. D., B. Kovnat, D.D.S., and Joseph H. Kauffmann, D.D.S. Redford K. Johnson, M.D., read his original translation (from the Latin) of the 17th-century parchment, which had been presented to the Association by Italian medical and stomatological societies in recognition of the service rendered by the Association in assisting them in the government-standardization of medical and dental curricula.

On January 18, 1928, a large group of the New York Fellows journeyed in a private Pullman to Philadelphia, where they were met by the Philadelphia Fellows. These two groups held a dinner at the Penn Athletic Club, Rittenhouse Square. Following the dinner, at which thirty-eight had been present, a meeting of the Association was held at the Philadelphia College of Physicians, 15 South 22nd Street. Sixty-nine attended this meeting, which was conducted by Vice-President Mackenzie. President Satterlee delivered a short address on the activities of the Association. Two papers were presented at the scientific session: (1) "Stomatology in its relation to internal medicine," by Judson Daland, M.D., Philadelphia. Formal discussion by Ross Hall Skillern, M.D., Philadelphia, from the standpoint of the laryngologist; G. Oram Ring, M.D., Philadelphia, from the standpoint of the ophthalmologist; and M.L. Rhein, M.D., D.D.S., New York, from the standpoint of the stomatologist. (2) "The need of stomatology from the standpoint of the dentist," by John Lawrence Kelly, D.M.D., New York. Discussion by Earl C. Rice, D.D.S., Philadelphia. General discussion followed.

On February 8, 1928, President Satterlee, after a short illness, died at his home at Riverdale, New York City, in his fifty-fifth year. Ed-

ward Frankel, Jr., M.D., New York, was unanimously elected President to succeed Dr. Satterlee. Westley Marshall Hunt, M.D., New York, was elected Secretary. Henry Hall Forbes, M.D., New York, was elected a vice-president. All others retained their offices.

On April 16, 1928, the stated annual meeting of the Association was held at the Columbia University Club, New York City, following a formal dinner of the Fellows and their guests in the large dining-room of the Club, President Frankel acting as toastmaster. The guests of honor were Sir St. Clair Thomson, distinguished British otolaryngologist of London, England, and Raúl Cibils Aguirre, M.D. celebrated South American pediatrician of the University of Buenos Aires, and President of the Pediatric Society of the Republic of Argentina. The toastmaster introduced the following speakers: D. Bryson Delavan, M.D., Henry Hall Forbes, M.D., José A. López, M.D., Ichiro Katayama, M.D., physician-in-charge of the Research Laboratory of the International St. Luke's Hospital, Tokio, Japan, Dr. Aguirre, and Sir St. Clair Thomson. Seventy-one persons were present at this dinner, among them Franz J. A. Torek, M.D., Lewis A. Coffin, M.D., Lewis Webb Crigler, M.D., John T. Hanks, D.D.S., William H. Haskin, M.D., Arthur Nilsen, M.D., Barnum Brown, A.B., Frederic W. Bancroft, M.D., Thomas J. Harris, M.D., A. Bern Hirsh, M.D., John Oppie McCall, D.D.S., Stanley Brady, M.D., Harold J. Leonard, D.D.S., Walter T. Dannreuther, M.D., Vethake E. Mitchell, D.D.S., Ward Bryant Hoag, M.D., Bissell B. Palmer, Jr., D.D.S., Charles Frederick Tenney, M.D., George F. Jernigan, D.D.S., George A. Weyth, M.D., Frank Richard Herriman, M.D., Stanley Slocum, D.D.S., George W. Shera, D.D.S., Rex T. Taylor, D.D.S., George W. Mackenzie, M.D., Alexander Nicoll, M.D., George Edwin Davis, M.D., Marshall C. Pease, M.D., Malford W. Thewlis, M.D., Meyer L. Rhein, M.D., D.D.S., Hilton H. Stothers, M.D., H. Franklin McChesney, M.D., Milton Arlanden Bridges, M.D., Charles G. Darlington, M.D., and John Horn, M.D. At the meeting following the dinner, Redford K. Johnson, M.D., read resolutions prepared under the chairmanship of Laurance D. Redway, M.D., on the death of Dr. Satterlee. The following papers were presented: (1) "Health diagnosis in stomatology," by William R. P. Emerson, A.B., M.D. (by invitation), Professor of Pediatrics, Tufts Medical School, Boston;

President of Nutrition Clinics, Inc., Boston; Consultant in physical fitness at Dartmouth College. Discussion by Robert Hugh Rose, A.B., M.D., and John Lawrence Kelly, D.M.D. (2) "Stomatology in its relation to dentistry," by Leroy M. S. Miner, D.M.D., M.D., F.A.C.S. (by invitation), Dean of Harvard University Dental School, Boston, Mass. Discussion by John Oppie McCall, A.B., D.D.S., F.A.A.P., F.A.C.D., Professor of Periodontology, at the College of Dentistry of New York University. General discussion ensued. The following resumé of the aims and purposes of the American Stomatological Association was printed and mailed with the notices of this annual meeting, having been prepared by Robert Hugh Rose, M.D.:

"Stomatology is the science of the mouth. Focal infections are responsible for much illness; infecting, among other parts, the eyes, sinuses, throat, gastro-intestinal tract, arteries, heart, kidneys, bones and joints. The *mouth* is one of the most important sites of focal infection, and, as a location of disease, has not received the attention it deserves. *The American Stomatological Association* seeks to stimulate the *study*, by the professions of medicine and dentistry, of diseases of the mouth. By promoting the study of *stomatology*, we hope:

"(a) More successfully to treat diseases of the mouth;

"(b) To prevent in future much of the disease now occurring in the mouth;

"(c) To bring about, for the average man, his prerogative, viz., normal teeth, properly nourished, regular, articulating well, free from pyorrhoea and abscess, and set in well-developed jaws;

"(d) To reduce the incidence of diseases resulting from unhealthy mouths; and thereby

"(e) To prolong human life at least a decade.

"In bringing about these results, we desire to work toward:

"(1) The development of the science of stomatology; and

"(2) A closer relation between physicians and dentists."

Each of the succeeding meetings has been held at the Columbia University Club, 4 West 43rd Street, New York City. Each was preceded by an informal pre-meeting dinner for the Fellows and guests, to which members of the medical and dental professions and their guests were cordially invited.

November 14, 1928. Resolutions were read by Dr. Robert Hugh

Rose on the death of Meyer Louis Rhein, M.D., D.D.S., who died at his home in New York City on July 16, 1928, in his sixty-ninth year. The scientific program consisted of a paper on "Infections of the ear, nose and throat," by the organisms of Vincent's angina," by John M. Loré, M.D., New York (by invitation). Discussion by Arthur Nilsen, M.D., and Francis S. McCaffrey, D.D.S., both of New York. This was followed by a lantern-slide demonstration on "The common diseases of the mouth," by Joseph Jordan Eller, M.D., of New York (by invitation), who gave this presentation for Fred Wise, M.D., of New York, who had prepared the slides, but was prevented by sudden illness from attending.

December 10, 1928. The guest of the evening was Prof. Viggo Andrésen, Director of the Department of Orthodontia at the National Institute of Dentistry, Oslo, Norway. Dr. Andrésen read a paper on "Artificial mineralization as a part of caries-prophylaxis," giving data of his original research. Scientific program—Symposium on "Focal infection; a consideration of mouth conditions as causative factors of disease:" (1) "Ophthalmology," by Dr. Geo. Huston Bell, M.D., New York (read by Dr. Robert Hugh Rose for Dr. Bell who was absent on account of illness). (2) "Otolaryngology," by Arthur Nilsen, M.D., New York. (3) "Dentistry," by Harold J. Leonard, D.D.S., New York. (4) "Gastro-enterology," by Redford K. Johnson, M.D., New York. (5) "Urology," by William R. Delzell, M.D., New York. (6) "Roentgenology," by Russell Wright Morse, M.D., New York (by invitation). Discussion by Robert Hugh Rose, M.D., Charles Winfield Perkins, M.D., John Oppie McCall, D.D.S., and others. Fellows elected: Joseph Martin Glaser, D.D.S., Jamaica, N. Y., H. J. Leonard, D.D.S., New York, and W. W. Morrison, M.D., New York.

April 29, 1929: annual meeting. The speakers at the dinner were Emil Mayer, M.D., Vice-President Henry Hall Forbes, M.D., David H. Jones, M.D., and Frederick P. Reynolds, M.D., all of New York. Dr. Frankel acted as toastmaster. Victor H. Sears, D.D.S., New York, was elected Secretary to succeed Dr. Westley M. Hunt. All other officers were re-elected. Scientific program: (1) "Stomatological conditions encountered in general practice," by Douglas Burnett Parker, M.D., D.D.S., New York (by invitation). (2)

"Cysts of the mouth," by Ferdearle J. Fisher, D.D.S., Oral Surgeon to the New Jersey State Hospital at Trenton, New Jersey. (3) "Clinical and roentgen-ray interpretations of dental and oral lesions," by Armin Wald, D.D.S., New York (by invitation). Discussion by Emil Mayer, M.D., Henry Hall Forbes, M.D., Henry Sage Dunning, M.D., D.D.S., and Harry Neivert, M.D.

October 29, 1929. Fellows elected: Arthur W. Bark, D.D.S., Edwin B. Bilchick, M.D., Cornelius G. Coakley, M.D., Henry Sage Dunning, M.D., D.D.S., Frank Richard Herriman, M.D., Francis S. McCaffrey, D.D.S., Emil Mayer, M.D., Alfred Owre, D.M.D., M.D., Douglas B. Parker, M.D., D.D.S., Frederick P. Reynolds, M.D., John B. Solley, Jr., M.D., and Armin Wald, D.D.S., all of New York. Scientific program: (1) "Personal experiences with local anaesthesia," by Emil Mayer, M.D., New York, Permanent Chairman, Committee on Local Anaesthesia, Therapeutic Research Committee, American Medical Association. (2) "Local anaesthesia in oral surgery," by Henry Sage Dunning, M.D., D.D.S., New York, Professor of Oral Surgery, Columbia University. (3) "Gross anatomy in relation to nasal and oral surgery," by Harry Neivert, M.D., New York (by invitation). Discussion by Henry Hall Forbes, M.D., Francis S. McCaffrey, D.D.S., Arthur Nilsen, M.D., Dudley C. Hughes, D.D.S., James J. King, M.D., Edward Frankel, Jr., M.D., C. W. Perkins, M.D., I. W. Voorhees, M.D., and Stanley Slocum, D.D.S.

April 8, 1930. Fellows elected: Abbott Trask Hutchinson, M.D., New York, and L. Shepherd Wilson, M.D., D.D.S., Jackson Heights, N. Y. Scientific program: (1) "The maxillary sinus; general consideration of involvement secondary to disease of the teeth and alveolar process," by George W. Mackenzie, M.D., Philadelphia. (2) "The viewpoint of the dentist," by Dudley C. Hughes, D.D.S., New York. (3) "The viewpoint of the physician," by Westley M. Hunt, M.D., New York. Discussion by Henry Hall Forbes, M.D., James W. Babcock, M.D., James J. King, M.D., Francis S. McCaffrey, D.D.S., James L. Zemsky, D.D.S., William H. Haskin, M.D., Leon T. LeWald, M.D., Harold J. Leonard, D.D.S., all of New York, and Joseph W. Post, M.D., Philadelphia, and George B. Trible, M.D., Washington, D. C.

A small group of the Fellows attended the dinner given to Dr. D.

Bryson Delavan, by the New York Academy of Medicine on May 1, 1930, in celebration of his eightieth birthday.

May 6, 1930: annual meeting. Fellows elected: I. Hirschfeld, D.D.S., New York; George B. Trible, M.D., Washington, D. C., and Harry W. Prentice, D.D.S., New York. Scientific program on "Dental Nutrition:" (1) "Dietary factors concerned in the building and maintenance of teeth," by Walter H. Eddy, Ph.D., Professor of Physiological Chemistry, Teachers College, Columbia University, New York City (by invitation). (2) *Discussion:* (a) "The viewpoint of the biochemist," by Henry C. Sherman, Ph.D., Mitchill Professor of Chemistry, Columbia University, New York City (by invitation). (b) "The viewpoint of the clinical pediatrist," by Roger H. Dennett, M.D., Professor of Pediatrics, New York Post-Graduate Medical School and Hospital (by invitation). (c) "The viewpoint of preventive dentistry and dental research," by Harold J. Leonard, D.D.S., Professor of Dentistry, Columbia University, School of Dental and Oral Surgery, New York City. General discussion by Robert Hugh Rose, M.D., Charles F. Bödecker, D.D.S., Victor H. Sears, D.D.S., and Henry W. Gillett, D.D.S., all of New York. The officers were re-elected for the ensuing year.

Early in the spring of 1930 a roster of active Fellows of the Association for 1929–1930 was published in a booklet on the inside cover of which was printed a concise statement of the aims and purposes of the Association, as follows:

"First: To promote the development of the science of stomatology;

"Second: To establish and maintain a closer relationship and a better understanding between physicians and dentists."

December 16, 1930. Announcement was made of the death of one of the distinguished Fellows of the Association, Ross Hall Skillern, M.D., of Philadelphia, on September 21, 1930, at the age of fifty-four. Fellows elected: William C. Keller, D.M.D., Scott Johnson, M.D., W. DeCourcy White, Jr., M.D.S., Adolph Berger, D.D.S., Alfred Walker, D.D.S., Carleton W. Woods, D.D.S., William Dwight Tracy, D.D.S., Irving J. Sperber, D.D.S., Charles F. MacDonald, D.M.D., Irwin I. Alper, M.D., Ira Jay Berlove, D.D.S., M.D., Robert Marks, D.D.S., Constantine G. Psaki, M.D., Joseph Jordan Eller, M.D., all of New York, and Harry Edward Harvey, D.D.S., Norfolk, Virginia.

Scientific program: "Nutrition, health and teeth of the Eskimo of Arctic Alaska," by Leuman M. Waugh, D.D.S., F.A.C.D. (by invitation), Professor of Dentistry (Orthodontia), Columbia University, School of Dental and Oral Surgery; Dental Surgeon, Reserve, United States Public Health Service. General discussion followed. The Association adopted the resolution of its Council to dispense with its proposed Christmas Dinner and to donate the funds thereby saved to the Prosser Emergency Employment Committee. This resolution, which follows, was approved unanimously by a rising vote:

"*Whereas*, there are today in New York City an extraordinary number of jobless persons, many of them with dependents, who want to work and are unable to find employment and are therefore suffering great distress, misery and deprivation; and

"*Whereas*, this unprecedented situation in the richest and leading city of the nation is believed to be a community challenge, and its alleviation a civic opportunity as well as a duty and a responsibility; and

"*Whereas*, leading citizens of New York have joined together to form the Emergency Employment Committee, whose purpose is to raise $8,000,000 to provide constructive jobs during the period of the emergency, for unemployed family-heads residing in this city; and

"*Whereas*, this group has enlisted the support of thousands of New York's citizens who have already generously contributed approximately $5,000,000 and have enabled the Committee to provide nearly 1,000,000 days' work for unemployed persons, men and women included;

"*Be it hereby resolved*, that the *American Stomatological Association* join in this worthy work by dispensing with its proposed Christmas Dinner, and that it donate the funds thereby saved to the *Emergency Employment Committee*."

So far as can be ascertained, this was the only donation to the Prosser Emergency Fund by any medical or dental society as such.

January 20, 1931. Resolutions prepared under the chairmanship of Dr. Emil Mayer, on the death of Dr. Ross Hall Skillern, were read by Dr. Arthur Nilsen. The Secretary read a letter of thanks and appreciation from the chairman of the Emergency Employment Committee in recognition of the funds which had been donated by the Association at Christmas-time, 1930. Fellows elected: Thomas Biondo, M.D., Fred Squier Dunn, D.D.S., M.D., C. Fred GaNun, D.D.S.,

Gordon M. GaNun, D.D.S., Morgan B. Horton, D.D.S., H.J. Kauffer, D.D.S., Frederick F. Pfeiffer, D.D.S., Joseph E. Wilson, D.D.S., Martin Charles Tracy, D.M.D., all of New York. Scientific program: lantern-slide demonstration on "Dermatologic lesions of the mouth; differential diagnosis and treatment," by Joseph Jordan Eller, M.D., Assistant Professor of Dermatology, New York Post-Graduate Medical School; Dermatologist to Post-Graduate Hospital, French Hospital, Broad Street Hospital, Bushwick Hospital, and Norwalk General Hospital. Formal discussion by J. Frank Fraser, M.D. (by invitation), Lester R. Cahn, D.D.S. (by invitation), Eugene F. Traub, M.D., Fred Squier Dunn, D.D.S., M.D., Douglas B. Parker, M.D., D.D.S., Dudley C. Hughes, D.D.S., all of New York. President Frankel created a Program Committee and a Dinner Committee to assist in the work to which he had previously attended as Director, appointing Dr. Harold J. Leonard chairman of the former, and Dr. Irving J. Sperber of the latter.

February 17, 1931. In the absence of President Frankel, owing to severe illness, the meeting was conducted by Dr. Harold J. Leonard. Announcement was made of the death of John William Draper, M.D., New York, on January 27, 1931, at the age of fifty-nine. Fellows elected: Lester Richard Cahn, D.D.S., New York, and Barnum Brown, A.B., Curator of the Department of Palaeontology, American Museum of Natural History, New York. Scientific program—Symposium on "Trifacial neuralgia and other nervous disturbances about the teeth and jaws:" (1) "Diagnostic aspects," by Foster Kennedy, M.D., New York (by invitation). (2) "Dental etiologic factors" (histopathological), by Lester R. Cahn, D.D.S., New York. (3) "Surgical aspects," by Byron P. Stookey, M.D., New York (by invitation). General discussion followed.

March 10, 1931. Conducted by a member of the Council, Dr. Redford K. Johnson, in the absence of President Frankel who was still confined to his bed. A motion made by Dr. Joseph M. Glaser, that the Secretary be instructed to send a letter of well-wishing for a speedy recovery to Dr. Frankel, was carried. Scientific program: "The modern conception of bone formation and its relation to surgery," by Clay Ray Murray, M.D., F.A.C.S. (by invitation), Assistant Professor of Surgery, Columbia University, College of Physicians and Surgeons,

New York; Associate Attending Surgeon, Presbyterian Hospital, Medical Center, New York. Discussion by Douglas B. Parker, M.D., D.D.S., Charles F. Bödecker, D.D.S., and H. J. Kauffer, D.D.S.

April 14, 1931: annual meeting. President Frankel in the chair. Fellows elected: Maurice Lenz, M.D., and Theodor Blum, D.D.S., M.D., both of New York. Scientific program—Symposium on "Some social and economic problems before the medical and dental professions:" (1) "Social and economic problems of organized medicine and their solution," by Lorenz J. Brosnan, A.B., LL.B. (by invitation), General Council for the Medical Society of the State of New York. (2) "Social and economic problems of organized dentistry and their solution," by Alfred Walker, D.D.S., F.A.C.D., President of the New York State Dental Society. (3) "Possible educational solutions to the social and economic problems of the professions of medicine and dentistry," by Alfred Owre, D.M.D., M.D., A.B., Sc.D., Dean of the Columbia University School of Dental and Oral Surgery. Discussion by H. J. Kauffer, D.D.S., A. Bern Hirsh, M.D., Edward Frankel, Jr., M.D., Oscar J. Chase, Jr., D.D.S., Henry Sage Dunning, D.D.S., M.D., Harold J. Leonard, D.D.S., Theodor Blum, D.D.S., M.D., Maurice Lenz, M.D., and John Lawrence Kelly, D.M.D. Officers elected for 1931–1932: *President*, Edward Frankel, Jr., M.D., New York. *Vice-Presidents*, John B. Deaver, M.D., Philadelphia; Henry Hall Forbes, M.D., New York; George W. Mackenzie, M.D., Philadelphia; Charles H. Mayo, M.D., Rochester, Minn.; Oliver T. Osborne, M.D., New Haven, Conn. *Secretary*, Victor H. Sears, D.D.S., New York. *Treasurer*, Robert Hugh Rose, M.D., New York.

May 5, 1931. A dinner was given, in the Grey Room of the Columbia University Club, in honor of Dezsö Dobó, M.D., distinguished stomatologist of Budapest, Hungary, Oberstabarzt, Lieut. Col., R. A. M. C., Hungary, and Director of the Sanatorium "Siesta" in Budapest, by a group of his New York colleagues. Short addresses were made by L. M. Waugh, D.D.S., R. K. Johnson, M.D., W. D. Tracy, D.D.S., E. C. McBeath, M.D., D.D.S., B. E. Dahlgren, D.M.D., R. H. Rose, M.D., A. M. Davis, D.D.S., H. S. Dunning, M.D., D.D.S., M. Diamond, D.D.S., J. L. Kelly, D.M.D., C. M. Gearhart, D.D.S., M. C. Tracy, D.M.D., I. S. Veblen, D.D.S., J. B. Solley, M.D., G. F. Lindig, D.D.S., D. B. Parker, M.D., D.D.S., A. Berger, D.D.S., H. J. Leon-

ard, D.D.S., K. F. Chase, D.M.D., F. A. Stewart, Jr., D.D.S., Alfred Owre, D.M.D., M.D., and Dezsö Dobó, M.D. President Frankel acted as toastmaster.

May 12, 1931: Held in the Westinghouse Lighting Institute, Grand Central Palace, 46th Street and Lexington Avenue, New York City. Fellows elected: C. F. Bödecker, D.D.S., E. C. McBeath, D.D.S., M.D., F. A. Stewart, Jr., D.D.S., and K. F. Chase, D.M.D., all of New York. Election to Honorary Fellowship: Dezsö Dobó, M.D., Budapest, Hungary. Scientific program: (1) "The history and art of roentgenology," by L. G. Cole, M.D. (by invitation), Roentgenologist to the Fifth Avenue, French, Bronxville, Booth Memorial, and United Portchester Hospitals; Consulting Roentgenologist to the Memorial Hospital, New York. (2) "Developments in the art of radiography," by H. G. Petsing (by invitation), Educational Director of the Westinghouse X-ray Company, in charge of educational work in roentgenology throughout the United States. Discussion by C. W. Perkins, M.D., Norwalk, Conn., R. W. Morse, M.D., New York, J. L. Kelly, D.M.D., New York, and F. J. Fischer, D.D.S., Trenton, N. J.

It is the purpose of the Association to maintain a high standard in its membership. To this end, the qualifications of applicants for Fellowship are carefully examined by the Council assisted by a Medical Advisory Board and a Dental Advisory Board. Unless otherwise announced, the meetings of the Association are held on the second Tuesday of each month, from October to May inclusive, at the Columbia University Club, 4 West 43rd Street, New York, following the customary pre-meeting dinners, the purpose of these dinners being to induce more congenial fellowship and sociability between the members of the two professions.

Beginning with the year 1931, the Association became one of the societies affiliated with and supporting the publication of the *Journal of Dental Research*, now in its eleventh volume. The editors elected to represent the Association are Harold J. Leonard, D.D.S., and Edward Frankel, Jr., M.D. In the present issue of the *Journal* the paper read at the meeting on May 6, 1930, by Dr. Walter H. Eddy, with discussions by Drs. Henry C. Sherman and Harold J. Leonard, represent our initial contribution, and with this we make our bow on the pages of this magazine (page 349).

152 West 58th Street

DIETARY FACTORS CONCERNED IN THE BUILDING AND MAINTENANCE OF TEETH[1]

WALTER H. EDDY, M.A., PH.D.[2]

Department of Physiological Chemistry, Teachers College, Columbia University, New York City

My first contact with the subject of dentistry might be described as a process of adsorption. I was in process of learning to be a biochemist under the able guidance of Dr. Gies when in 1909 he began his dental studies and I observed, though didn't actually engage in, those earlier researches. In 1915 I first contacted with Casimir Funk and began my work on vitamins. The vitamin study has been leading me in various directions ever since, and during the past two years has brought me back to dentistry. I would like then, tonight, to begin my consideration of the subject assigned with a résumé of the experiments that carried me from vitamin-C assaying into a consideration of the nutrition of teeth.

Some of you know that during the past six years I have made a rather extensive study of the antiscorbutic value of canned fruits and vegetables, bananas, and other types of food products. In conducting these assays I naturally employed the method worked out by Sherman, La Mer, and Campbell. This method determines the minimum protective dose of a foodstuff necessary to protect a guinea pig from scurvy over a period of ninety days by a combination of feeding test and autopsy findings at the end of the period. The method is good but long. By the time your animals are sorted out and the unfit eliminated, the test itself completed and plotted, at least four months have elapsed. Was a shorter method possible? In 1926 appeared a shorter method advocated by Höjer. He offered a 20-day test using

[1] Presented at a meeting of the American Stomatological Association, Columbia University Club, New York City, May 6, 1930.

[2] Dr. Eddy, besides being a member of the Faculty of Teachers College, is also a licensed professional engineer of the State of New York, and is employed as the Director of the Bureau of Sanitation of the *Good Housekeeping Magazine*.—[*H. J. L.*]

the histology of guinea-pig teeth as the index of adequacy or inadequacy of vitamin C. The idea that teeth respond quickly to the presence of scurvy was not original with Höjer. So far as I know Jackson and Moore were the first to describe the phenomenon in teeth, while Zilva and Chick of the Lister Institute studied it somewhat extensively. Later, Howe and Wolbach devoted increasing attention to the rôle of vitamin C in teeth and in 1926, the same year Höjer's paper appeared, reported data which not only supports Höjer's idea of specific response of odontoblasts to lack of vitamin C, but also advanced a theory of the rôle of vitamin C in this tooth response. In brief, that view is that vitamin C functions much as the housewife's pectin in jelly making. It "sets" the "liquid" dentine proliferated by the odontoblasts. At the time Höjer's paper appeared I was more interested in the brevity of his method than in tooth scurvy. That interest developed later.

I checked Höjer's papers and the collateral evidence of Wolbach and Howe. I read the papers of Goettsch and Key and noted their success with the method. I enlisted the aid of Dr. G. Dalldorf, pathologist, and my research assistant Miss Zall, and we began a series of tests that established my faith in the specificity of the method. These results have been already published. I need recapitulate here only the outstanding results; namely, that when the test was applied to canned string-beans, orange juice, and bananas, it was possible in a 16-day feeding test to learn, from guinea-pig tooth-sections, the dosage of antiscorbutic that was fully productive of normal dentine; to completely derange the dentine and odontoblasts by lesser doses; and that in all these tests the amount necessary for normal dentine was at least twice that necessary to protect against macroscopic symptoms of scurvy. My immediate quest was satisfied. The Höjer test functioned well as a tool for vitamin-C assay. Meanwhile Hanke presented a related paper at the International Physiological Congress last August. My study of Howe and Wolbach's histological work led me to more detailed study of Howe's views of the rôle of vitamins C and A in dental nutrition. In brief, I began new experiments with a different objective; namely, the rôle of vitamins in the maintenance of normal dentition.

One of our first tests involved the behavior of an erupted incisor in

contrast to the unerupted member of the lower pair when diets were inadequate in vitamin C. They showed that use and disuse affect the rate of dentine derangement, use greatly increasing the disfunction of the odontoblasts. But they also showed that while an erupted tooth rapidly regenerates on a normal diet, omission of vitamin C from the diet would in a few days not only produce a changed dentine but actual cessation of tooth regeneration. Furthermore, this tooth's growth was restorable by adding vitamin C to the diet and its growth rate proportional to the amount of vitamin C added. Hanke's and Howe's views seemed to find support in these tests. But, as with most tests devised for a specific purpose, new suggestive data appeared. Our basal diet was supposedly adequate in vitamins A and D. Goettsch and Key had shown that the tooth response to vitamin-C variation was apparently independent of the vitamin-D content of the ration. Our tests however showed that greens as an antiscorbutic stimulated a more rapid tooth regeneration than either orange or tomato juice. Why? Did tooth growth require a combination of vitamins A and C much in excess of the amount necessary to normal body growth and did the greens supply this extra vitamin A?

If we consider the tooth a living organ, with its own particular metabolism, we may assume that, like other body tissues, it is profoundly affected by a whole series of nutritional factors, among them vitamins. By analogy with bone formation you would expect vitamin D to be concerned. I was familiar with Grieves' work with rats on McCollum's low-vitamin-D diet. I also knew that rats did not show macroscopic scurvy on a vitamin-C-free diet, and that the explanation was that rats synthesize the vitamin C necessary to their needs since the livers of rats on a vitamin-C-free diet cure scurvy in guinea pigs. Does the rat synthesize his tooth needs? Were Grieves' pathological findings due solely to lack of vitamin D? We have fed rats on a vitamin-C-free diet rich in cod liver oil. We got a case of beautiful scorbutic dentine. We repeated the test without the cod liver oil, but with irradiation to supply vitamin D. The picture changed—the odontoblasts had atrophied. Again vitamins A and C appear as factors in the dental picture but with different effects.

We are now studying other vitamin deficiencies and their effect on rat and guinea-pig dentition. Dr. Bödecker is giving us the benefit of

his histological experience in these studies. We hope to localize and define the rôle of vitamins A, B, C, and D in the production and maintenance of normal structures before these studies are completed. We are hopeful that the rat will prove as useful as the guinea pig in these studies since its dentition is much more similar to ours than is the guinea pig's. Also, since the first two molars of the rat erupt fourteen days before the third, the rat would permit comparative study of forming versus finished teeth in the same mouth.

This brief outline illustrates the point I made in the beginning, that vitamin studies have interested me in the nutrition of teeth. With that interest has come a very keen curiosity as to whether the study of dental nutrition may not be a productive approach to the solution of the problems of caries, periodontoclasia, and other tooth-pathology problems. I have therefore welcomed the opportunity given me by Drs. Leonard, Bödecker, McBeath, and other members of the dental staff in Columbia, to enter this, to me, new field. The recency of my contact finds me painfully ignorant of much of the splendid body of research already published in your field, but I am making valiant efforts to remedy that defect as rapidly as possible. Am I wrong in believing that, owing to general acceptance of Miller's theory of caries and the attention the experimentalists have given to combatting germs and acids by oral hygiene and dentifrice modification, the papers already published deal preponderantly with this phase of dentistry rather than with tooth metabolism? Also that, while Marshall, Howe, and many others have recognized the probable rôle of the living tooth-tissue in defense against disease, the detailed experimental studies of how a tooth is fed and made resistant by diet are matters on which data are at least meager? It would not be at all strange if this were true. We are still in doubt as to how ingested calcium actually reaches bone, what sorts of dietary calcium are best, what effect other materials in the diet have on this lime absorption, circulation and deposition. Therefore it would be very surprising to find a complete picture of even this single phase of tooth formation. The papers that I do find on the physiology of the tooth and its layers, Bödecker's studies of tooth circulation, Klein and Amberson's study of the powers of enamel cuticle to change electric charge and thereby repel ions of like charge or attract ions of different charge, seem to be very impor-

tant suggestions that in the behavior of the tooth itself, rather than in changes of environmental factors, may be found the real etiology of caries and periodontoclasia. If the tooth itself determines whether it shall succumb to germs or fight them, just as the rest of living tissue determines whether it shall succumb to typhoid or "T. B.," isn't it logical to pay more attention to the diet and physiology of this army even though we abate not at all in the means of scattering, destroying and eliminating the environmental attacking factors?

The few studies that I have reported tonight suggest that the vitamin-C content of the diet may be *a factor* in resistance to caries by maintaining a proper anatomical structure through which may circulate the other factors concerned in the fight against lactic acid and B. acidophilus or B. odontolyticus. All my nutritional experience however rebels against the idea that it is the *sole factor* involved. Empirically I think Hanke is justified in trying out his pint-of-orange-juice treatment, and urging others to try it, provided it is understood that such treatment may be expected to yield both success and failure, and that the failures should be even more carefully noted and studied than the successes. This nutritional attack on caries is not going to glorify any single factor, and we must not let our enthusiasm over any treatment cloud our logic or induce neglect of the study of contributory measures. I think we should also try to resist the temptation to justify a given method by armchair logic at the expense of recorded test and effect. Davis' enthusiasm over his alfalfa-copper-iron treatment for anemia, and his balanced calcium-phosphorus pills to restore dentine to normalcy, would register more strongly with me if his advocacy led him to the publication of more experimental data and less to manipulation of observations made in quite other types of studies to justify his procedures.

I have a respect for empiricism. When sick I am more interested in cure than in the reasons underlying the treatment. I know that Jacobi used to tell students that in rickets they should either get their babies into the sunlight or give them cod liver oil. But rickets as a disease owes its present rarity to knowledge of the factors involved and how to utilize them. The etiology of rickets today proves that while Jacobi's empiricism was effective, he had not outlined all the factors involved or provided the facts necessary to prevent as well as cure rickets.

If time permitted I would review some of the more important studies already made in other fields that seem to carry suggestions as to how to proceed with the study of dental nutrition. I wonder how many of you know of the recent work of Arnold and his coworkers on the self-disinfecting power of skin cuticle (*Am. J. Hygiene, 11*, 345; March 1930). Most of us consider the outer skin-layer, the corneum, as a finished inert layer renewed from below, continuously sloughing off, free from nerves, and may be cut without pain. Arnold has found that this layer in life and health maintains a constant acidity (pH 5.18–5.22), that the under skin is alkaline (pH 7.1–7.4). That if the corneum is clean and bacteria are painted on it they will promptly die. That if, with dirt or vaseline, the same bacteria are kept from contact with this live, acid, corneum, they do not die. That as soon as death occurs this layer loses it germicidal power. That if it is removed, and the bacteria are laid on the alkaline lower layer, they do not die. This germicidal power is lacking in the skin under the finger nails. Does this look as though the activity of the corneal layers can be ignored? Will these types of study apply to enamel cuticle? Will an Arnold extend the work on body cuticle and find germicidal activity in this tooth layer? Will its ability to resist the invasion of bacteria and acids also be found to depend upon its H-ion concentration, its dietary supply, the continuity of circulation from pulp cavity through dentine, its anatomical and chemical composition?

I close, reiterating my pleasure in being invited, not as a lecturer, but as a coworker on what I am sure is going to be a long and complicated study although I hope a fruitful one.

DISCUSSION[3]

Henry C. Sherman, M.A., Ph.D., Sc.D. (New York City): Dr. Eddy has spoken so fully and clearly of the relations of vitamins C and D to the teeth that I shall not attempt to add to these topics. A word should, perhaps, be said regarding vitamin A. When the original conception of a fat-soluble vitamin was differentiated into vitamins A and D, the strikingly prominent relation of vitamin D to skeletal development led to the assumption that this part of the fat-soluble vitamin-complex would be especially concerned in

[3] A report of the discussion of the subject from the standpoint of pediatrics, by Dr. Roger H. Dennett, has not been presented for publication.

dentition also. The work of several investigators has supported this assumption. I think, however, it will be found that vitamin A as well as vitamin D is an important factor in the development and health of the teeth. I understand that the joint work of Drs. Wolbach of the Harvard Medical School and Howe of the Forsyth Dental Clinic is tending strongly in the direction of emphasis upon the importance to the teeth of liberal supplies of vitamin A as well as of vitamins C and D. Whether vitamins B and G are factors in dental nutrition remains to be determined. A strong trend of current work in the direction of linking the nutrition of the teeth to that of the skeleton in general, and the nutrition of the skeleton to the general nutritional condition of the body, makes it logical that we should at least maintain an open-minded attitude toward the possibility that all of the vitamins essential to mammalian growth and health may play parts in dental nutrition. But the aspect of our general subject which I think I am expected to discuss more particularly is the relationship of calcium and phosphorus in supplying the chief mineral materials of which the teeth are built, and with which their upkeep of structural material is maintained.

It is a fact of the utmost importance in the chemistry of nutrition that the body at birth is relatively calcium-poor, and to a less extent also phosphorus-poor. This is primarily because the bones are not yet hardened by deposition of anything like the concentration of calcium phosphate which they normally have in their adult state. Normal development, therefore, requires a supply of phosphorus relatively more liberal than that of most building materials, and a supply of calcium relatively more liberal than that of phosphorus. At least 99 per cent of the calcium which must be acquired by the body from its food, and retained for the proper development of the bones and teeth, goes into these structures. Calcium is also essential to all the soft tissues and fluids of the body; but the amounts which they need are so much smaller that they do not appear as serious competitors with the bones and teeth for calcium in this connection; although, under certain conditions in which the body loses calcium, the bones and teeth may be drawn upon to keep up the normal calcium content of the blood and lymph.

Of the phosphorus acquired and retained by the growing body, about two-thirds is normally distributed to the bones and teeth, and about one-third to the soft tissues. The rapidly growing muscles of the young child need a relatively large amount of phosphorus, and in a sense compete with the bones for the phosphorus which the blood serum brings. Often the growing muscles appear to "out-run" the growing bones in this competition for the available phosphorus supply, especially around the second half of the first year of life. Hence the relative frequency of the low-phosphorus type of rickets

at or about this age. But notwithstanding the fact that the baby goes through a period in which the rapid growth of his muscles may cause a relative deficiency of the phosphorus supply to the growing bones, there is a greater danger, and for a longer time, that the intake of calcium may be deficient. I hasten to add that the word deficient here is not to be taken in an alarmist sense. The relative deficiency of calcium here considered does not necessarily mean anything that can be seen clinically. It means rather that the calcium intake is lower than the optimum. Another way of describing this all-too-common condition of affairs in the growing and developing body is to say that when the food, even though abundant and apparently good, is not as rich in calcium as it should be for the best results, the body, while to all outward appearances making an entirely normal development, is nevertheless retarded in its deposition of calcium phosphate in the bones and teeth.

Because this condition of a slightly calcium-poor body with retarded calcification of bones and teeth does not reveal itself to the examining physician, it is apt to remain unknown and perhaps even to be somewhat skeptically regarded when pointed out as a finding of laboratory research. Its reality, however, is now abundantly established, both by extensive and painstaking quantitative studies of the balance of intake and output of calcium in children of different ages and receiving different amounts of calcium in their food, and by extended analyses of experimental animals as to their calcium content at different stages in their growth and development, and as influenced by the calcium content of their food. In experimental animals representing a general type and condition of nutrition very common among children, it has been definitely shown, especially by the experimental work of MacLeod, that additional amounts of vitamin do not suffice to enable the body to overcome this retardation in its normal calcification. What is needed is more of calcium itself. Furthermore, the work of Booher has shown that, with a diet excellent in all other respects, but not rich enough in calcium for optimal results, the body may remain somewhat calcium-poor for a very long time, perhaps throughout the whole period of growth. The development may be apparently entirely normal and the body may be storing calcium; yet so long as it does not get sufficient calcium in the food to enable it to store this element in relatively large amounts, it is retarded in reaching that degree of hardness of bones and teeth which would be optimal for the given age. When we consider that the teeth are undergoing hardening, and are still particularly susceptible to injury or decay, during this same period of approximately the first twenty years of life, it is plain that for the body to be even slightly handicapped in acquiring the large amount of cal-

cium it needs throughout this period for its optimal development, may be seriously detrimental to the best interests of the teeth, even though we cannot see that the general health is being impaired.

This calcium-poor condition of the body as a whole and of the bones and teeth cannot be detected by even the most careful physical examination, nor in fact by determination of calcium in the blood serum. Fairhall found that with a sub-optimal calcium intake the calcium content of the blood could be brought up to normal by irradiation, and that rickets was thus prevented; but that the body remained calcium-poor. A very careful investigation of the amount of calcium needed in the food of the child to support optimal storage of calcium, and presumably to support optimal development of bones and teeth, was made by Hawley a few years ago. This work was done before the recognition of vitamin D, but, as the children in the experiments enjoyed an abundance of outdoor sunshine just before and during the period of observation, it is certain that they had an ample supply of vitamin D even though this was not then known. Hence the subsequent discovery of vitamin D and its relation to calcification does not change the interpretation of Hawley's results. Even with an abundance of vitamin D, optimal storage of calcium for development of bones and teeth requires a very liberal amount of calcium in the food, best supplied chiefly by means of milk. The following editorial comment of the *Journal of the American Medical Association* upon Hawley's experimental work is still very much to the point:

> "The dietary rule of a quart of milk each day for every child is much more than a precept based on individual opinions or drawn by analogy from the results of feeding experiments with lower animals; it now rests on scientific evidence obtained by extensive and intensive experiments directly upon the children themselves."

By no means would I give the impression of advocating a liberal calcium intake as a panacea in itself. In my judgment, no one chemical factor is to be thus regarded. The development and the maintenance of sound teeth undoubtedly involve the interaction of several chemical factors. Perhaps the most helpful approach to a simplified form of statement of the relation of the chemical factors of diet to the development and health of the teeth may be found in the conception which McCollum has so often and ably advocated, and in connection with which he coined the phrase "protective foods." This phrase we now tend to use in a somewhat broader sense than McCollum first used it, especially since we have become impressed with the great practical importance of liberal supplies of vitamin C as well as of calcium and vitamin A—to which we should perhaps also add the more recently

discovered vitamin G. Hence, to put in a few non-technical words the general bearing of recent developments in the chemistry of food and nutrition upon the problems which we are considering, one might say that every effort should be made to see that the dietary, particularly of the child throughout its whole period of growth, contains very liberal amounts of milk and fruits, and also moderately liberal amounts of vegetables and eggs. This may not solve the whole stomatological problem, but it is certainly in the interest both of good teeth and of good general health.

Harold J. Leonard, D.D.S., B.A. (New York City): It is, I feel, a great honor and opportunity to present the concluding discussion of this subject on behalf of the groups most vitally concerned: those teaching and practising preventive dentistry, and those engaged in and interpreting dental research. Dentistry early in the last century was cast out and branded by medicine as a trade or mechanical art with very little if any relation to other branches of the healing profession. With this push away from a physiologic approach to dental problems, combined with an immediate need for developing dental repair and restoration, American dentistry has devoted its genius to its mechanical problems with results that are in their way the admiration of the world. It is only within the last twenty years that there has developed in both professions an appreciation of the fact that the teeth are intrinsically related to the rest of the body, and that the problems relating to the prevention and cure of dental diseases must be approached, as in the case of diseases of other body parts, by way of the fundamental biological sciences. Joint meetings of physicians and dentists, such as this organization fosters, which are becoming more and more frequent, are precursors of the fast approaching time when dentistry and medicine will be not coöperating friends and business associates, but members of the same family profession. Knowledge is being so rapidly developed by researches like those Dr. Eddy is making, that it is becoming more and more difficult for the medical man to do his work without information on dental health and disease, and for the dentist to do his best without having the educational background and legal status of the physician.

Dr. Eddy has suggested that the last thirty years of research on dental caries has been so barren of practical results because Miller initiated a wrong lead, by which we have approached the problem of the causes of dental caries purely from the standpoint of their external environment. By so doing he diverted attention from possible factors within the tooth associated with nutrition, which it now seems may play a rôle in susceptibility to this disease. I think we should not place the blame for our wrong lead on Miller. He did not attempt to explain the causes of susceptibility. His work

was on the pathologic process itself, the bacteria concerned, their mode of attack, and the histologic effects. It is the work and conclusions of J. L. Williams that have made it seem impossible that nutritional factors via the pulp could influence the caries process on the enamel surface. In 1896 Williams demonstrated, to the satisfaction of the dentists of the time, that the enamel after eruption is a lifeless, impervious structure containing practically no organic matter and therefore incapable of nutritional changes. In a brilliant series of articles in *Dental Cosmos*, 1896, he concluded a discussion of the formation of enamel with these sentences: "All of this structure can be plainly seen in mature enamel, but in normal enamel it is everywhere completely calcified and containing no trace of organic matter. No physiological change, therefore, is possible in completely formed enamel." These sentences, so well backed up by photomicrographs temporarily sealed the doom of a nutritional approach to the study of dental caries at least via the dental pulp.

The slow, patient work of Bödecker, Beust, and others, finally upset the 1896 conclusion of Williams, until in his papers of 1923 he reversed his former position to the extent of admitting that all human enamel is permeable to stain, that stain enters enamel through canals which connect with dentinal tubules and are the center of enamel spirals, and that each enamel rod is surrounded by an organic cuticle, certainly containing protein, probably keratin. He concluded there is no histologic evidence of any metabolism in enamel either organic or inorganic, but made this significant statement: "There is at present a growing belief with some that nutritional changes, true metabolic activity, take place in the enamel through the medium of this 'organic' matter. If we wish to apply the term 'metabolism' to inorganic, chemical changes, then we may say that theoretically this is possible." The way has thus been opened for a study of the effects of dietetic and nutritional changes coming via the blood stream, pulp, and enamel tissue fluid, on susceptibility of the enamel tissue to caries. It is not Miller's work that has been overturned. As yet no important evidence indicates that dental caries is due to other than the action on and in the tooth surface of bacteria, which convert carbohydrate food material in the mouth to acid, which in turn disintegrates the inorganic material of the enamel and dentin, and leaves the organic matrix of the dentin to be digested by proteolytic enzymes. The unanswered question is: What promotes the growth of aciduric organisms in or on the enamel in one mouth or at one time, and inhibits it in or at another?

At present the prevention of dental caries is in a very uncertain state, because the causes of susceptibility to dental caries are unknown. There

is a large amount of negative evidence but not any very satisfactory positive information. To show the condition of our knowledge, let me enumerate some of the demonstrated facts.

1. The initial formation of the tooth and enamel is not an essential barrier of defense after the tooth is erupted. Teeth with excellent form and structure frequently decay rapidly when the dietetic and hygienic habits create a susceptible environment. Conversely, despite gross faults in form and structure of the teeth, many persons are quite immune.

2. While dental caries is a pathologic process starting on the outside of the tooth and working inward, no chemical or physical factor, after a great deal of experimental work, has been found in the saliva or tooth environment that determines whether this process shall occur, or not.

3. Some factor does control this condition, for in certain instances not only has the caries process been prevented, but arrested.

4. Bacteria are present on all teeth, and the majority of the microörganisms found in all mouths are capable of fermenting sugars to form acids. In pyorrhetic mouths, usually, the growth is especially heavy; yet usually these mouths are immune to caries. The only difference in bacterial growth appears to be a preponderance in carious areas of the Bacillus acidophilus. This may be the only organism capable of forming an acid sufficiently strong to decalcify enamel and yet not be itself inhibited by it.

5. Artificial cleansing of the teeth is not a sure preventive of dental caries. Caries is delayed by it, but decay may occur despite recurrent cleansing. Conversely the least-cared-for mouth may be perfectly immune.

6. Dentifrices have little effect through chemical action in preventing decay. Their only value lies in aiding to remove physically the bacterial accretions.

7. Detergent foods are not a specific for immunity. Some mouths remain immune even while continuously coated with sticky carbohydrate food.

8. Saliva is never acid enough to decalcify enamel. Some of the most susceptible cases have a saliva of distinctly alkaline reaction.

9. Caries susceptibility is not a symptom of rickets. Non-rachitic children frequently have caries, and rachitic children sometimes do not.

10. It is not a symptom of inanition nor is it due to over-feeding. Both of these conditions are usually associated with comparative immunity.

11. It is not due to absence of lime in the diet. Many children getting a quart of milk a day are yet quite susceptible.

12. It is not due to a diet consisting chiefly of carbohydrate. Several

almost perfectly immune savage tribes live almost wholly on a soft carbohydrate diet.

13. The relation of vitamins to susceptibility is very inconclusive. The diets of immunes are often grievously defective in one or more of the vitamins, while those of susceptibles may seem to be adequate.

What is the solution of these paradoxes? I do not know. Yet, here and there immunity is being established. In McBeath's work in orphanages, in the effort to control caries with groups of susceptible children by experimental diets, he was surprised to discover in the first two orphanages chosen an almost perfect immunity to caries in all the children present. Inquiry showed that they were being scientifically fed on a well-rounded, moderate diet containing a sufficiency of all known food factors. Boyd and Drain think they have succeeded in arresting caries *in* susceptible children by adding a sufficiency of all accessory food factors to a diet predominately protein in one case, and carbohydrate in another. As Dr. Eddy has indicated, it is probably not a matter of lack or abundance of any one food factor, but of a balanced combination of several. Until we know the rôle of the various food factors in this condition and how they operate, we are working in the dark. The work of Eddy, Howe, Höjer, Zilva and others, on the pulpal effects of vitamin-C deficiency, may be a lead. As yet, however, it has not been interpreted to help in the solution of our problem.

That susceptibility to dental caries is a problem in nutrition seems almost certain. The rise and fall of the incidence of dental decay in certain racial groups of the past as they developed and receded from an agrarian civilization, the susceptibility of Esquimaux and other immunes to the disease when they have access to white flour, sugar and canned goods, the susceptibility of the majority of children who are on deficient diets—these and many more convince me that abnormal nutrition is at the bottom of our troubles. Just what the factors are and how they operate remains to be determined. That distribution of fluid through the enamel from the pulp is conceivable, and probable, does not necessarily mean that nutrition plays its entire rôle through this channel. We may yet find that the saliva contains the protective factor and is the medium to explore.

The research is just at the interesting stage. We have glimpses enough of success ahead to make it tantalizing. The way through, however, must be step by step, trying and proving each as we go along. So much remains to be done and the "laborers are few." Some of the steps to be taken seem to me as follows—the "general fronts" now being attacked in the study at the School of which I am a member:

1. Histological: Further work on the enamel to determine the mechanism by which physiological changes in structure may occur after eruption.

2. Biochemical: A study of the chemistry of the body fluids of individuals and animals who are now in a state of active susceptibility to dental caries as compared to those who are immune, in order to obtain a chemical index by which a state of immunity or susceptibility may be immediately determined.

3. Nutritional: A nutritional study (based on the foregoing) of means by which susceptible individuals or animals may be made immune. This will involve feeding experiments including various food types, salt mixtures, administration of internal glandular extracts, etc. A large number of animal experiments will be involved, as well as an intensive study of one or more groups of children under controlled conditions.

4. Bacteriological: A study of the microörganisms actually occurring in decaying enamel.

In this discussion I have so far said nothing of periodontoclasia, erosion and irregularity of teeth. There is excellent reason to think that these too are largely nutritional in origin and must be similarly attacked.

Dentistry is where medicine was twenty years ago before the development of graduate schools of medicine. It is just taking the steps to become a learned profession with the evolution of graduate departments, research work, and the application of the fundamental sciences to dental problems. At the rate of progress in some of the schools it will not be long before the practice of dentistry has as good a mastery of the diseases and their prevention in the field of dentistry, as the practice of medicine now has over the majority of those in the field of medicine.

A PRELIMINARY REPORT OF PERSONALITY TRAITS ESSENTIAL TO THE SUCCESS OF THE PRACTISING DENTIST[1]

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Success in dental practice is the ultimate goal of every student or practitioner of dentistry. A study that would aid in reaching this objective would seem to be worth while. The fact that individuals differ makes the definition of success a varying statement, for each individual has a mental conception of success which is different in many respects from the conceptions of others. This situation will always exist and will cause variables that in a study of this kind can be considered only to a limited extent. The dental teacher's aim is to develop successful dentists, and his success should be determined to a large extent by this criterion, rather than by the number of his students who pass the dental licensing board. Teachers hope to develop research workers, and high-grade specialists, but these phases of practice are highly individualistic, and the great majority of students will fill places in the larger field of general dentistry. The study we are making is an attempt to disassociate the personality of the successful dentist in general practice. We will consider him as an integrate personality, possessing all of the traits or qualities of personality that are essential to success in his field, and by a process of analysis or dissection, by members of his profession best qualified to judge, we shall try to ascertain these essential traits and their relative value, in order that other members of our profession, if possible, may be benefited by our findings.

Webster defines "success" as "obtaining the *object* desired." The *Standard Dictionary* defines "successful" as "the accomplishment of what is attempted or attended, to obtain the *object* or *end* desired." The object of dental art and science, according to Herman Prinz, is "to reduce suffering, to cure disease, and what is most important of

[1] Read at a session of the Ninth General Meeting of the International Association for Dental Research: *Journal of Dental Research*, 1931, xi, p. 495; June.

all, to maintain health by dental prophylaxis." A successful dentist should be one who accomplishes this end or objective. A great many of our fellow practitioners, at first thought, would object to this statement of dental success, but I think close analysis will convince them that by accomplishing this end "all else will be added unto them." My conception of a successful dental practitioner agrees with that of Dr. Prinz, and our investigation is an attempt to compile a list of personality traits, which, if possessed by an individual with normal motivation and training, would predispose for his success. It is important that we define first, a trait, then a personality trait. A trait is a distinguishing feature or quality, especially of mind or character, or anything produced by them. A trait of personality or an emotional complex is a tendency to react with a particular emotion to situations of a certain class, and under the influence of the emotion to exhibit certain types of thinking and conduct. It is generally a mode of reaction that tends to differentiate one individual from another. The study we are making is of these personality traits and a method of selecting them from the personalities of successful dental practitioners.

The simplest method of trait selection is the compilation by an individual of a list of a certain number of traits. The possessor of these traits will secure the desired object or end, success. Franklin selected thirteen moral virtues and carefully followed their precepts in an effort to lead the good life of the philosopher. A second method is to secure a consensus of opinion as to a trait selection, such as was formulated in the Oath of Hippocrates and in other professional or vocational codes. A third method, that of personnel analysis—the one we adopted—is the most exact. In this method significant qualities, traits, or ideals of both the successful and unsuccessful members of a specified group are analyzed, and the desirable traits are placed on a list. Undesirable traits, noted as a cause of failure, are changed to their opposites and placed on the list. Competent judges in the dental profession might be selected from

(1) Dentists employing other dentists
(2) Members of dental faculties
(3) Patients of dentists
(4) Dentists themselves
(5) Individuals having intimate contacts with the dentist in private,

social, or commercial life. Dental-supply dealers could be utilized to a limited extent.

Charters, in his "Teaching of Ideals," says a personnel of thirty judges is sufficient for a comprehensive study of trait selection. Our investigation is in its preliminary stages, but as our first step we have selected judges from the dental faculties of schools scattered over the United States. Charters states that most professions or vocations present a list of fifty traits at the beginning of a study, but this makes too fine a distinction or line of demarcation among the traits, and a final list should contain not more than twenty. After traits are selected, they must be described either in synonymous terms or in trait actions. A trait action is an activation performed by a person that demonstrates the possession of a trait. We might describe the trait action of ambition as follows:

(1) The studying of current professional literature

(2) Keeping well informed on topics of the day, current events, etc.

(3) Taking graduate or extension courses at intervals in order to keep abreast of professional progress

(4) Developing the cultural side of life, being interested in art, music, literature, etc.

The value of a trait in a list is based upon the number of times it is mentioned by the men who were interviewed or solicited in making the study. The measuring of more than a few traits of personality is difficult, and at present speed and accuracy are the only traits that can be measured fairly accurately. To accomplish the greatest accuracy in evaluating or measuring selected traits, we must

(1) Determine carefully what traits should be measured.

(2) Study the different degrees of complexity of each trait. For instance, honesty is a valuable trait, but the degree to which an individual possesses this trait is hard to determine. Honesty in the dental profession is easier to evaluate than honesty in industry, for the dental profession has a narrower range and hence should be easier to scale.

(3) Remember that subjective opinion plays a large part in measuring traits (two or more judges examining the same trait in an individual will give varying estimates of the amount that this trait is possessed by the individual). It is not uncommon to find an indi-

vidual graded *A* in friendliness by one judge, *B* by three, and *D* by a fifth.

(4) Give a more exact definition of what is meant by the terms used to describe traits. Initiative to one person may imply force, drive, or persistence; to another it may mean ability to begin or institute, even though the act is not carried to completion.

In spite of the obstacles listed above, we are encouraged to carry on our study by Thorndike's statement: "Whatever exists at all exists in some amount, and anything that exists in amount can be measured."

SUMMARY A

Original list of fifty traits of personality as compiled by Professor J. F. Dashiell

1. Robust physique
2. Energy (live-wire type)
3. Good memory
4. Tactfulness
5. Good personal appearance
6. Initiative
7. Patience
8. Industry
9. Resourcefulness
10. Accuracy
11. Readiness of speech
12. Keen observation
13. Self-control
14. Matter-of-factness
15. Aggressiveness
16. Optimism
17. Honesty
18. Leadership
19. Courage
20. Religiousness
21. Self-interest
22. Impressiveness of appearance
23. Sympathy
24. Open-mindedness
25. Precision
26. Cautiousness
27. Neatness and orderliness
28. Ability to be "a good mixer"
29. Refinement
30. Adaptability
31. Suggestibility
32. Emotional stability
33. Investigativeness
34. Possession of good habits
35. Self-assurance
36. Ability to make a quick decision
37. Reflectiveness
38. Impulsiveness
39. Thrift
40. Masterfulness
41. Stable-mindedness
42. Punctuality
43. Boldness
44. Firmness
45. Analytical-mindedness
46. Originality
47. Speculativeness
48. Independence
49. Conservatism
50. Economy

We have selected a list of fifty traits as compiled by Prof. J. F. Dashiell of the Psychology Department of the University of North Carolina (*Summary A*). This list was compiled from authoritative sources, such as articles and books that dealt with psychological aspects of vocational guidance. The list was sent to one hundred dental teachers scattered over this country, and seventy-nine of the lists were returned to us. The recipients of this list were asked to select twenty traits and number them, in the order of the importance of their possession, from one to twenty, one being the most important and twenty the

least important. The lists were returned to me and compilations made as to the number of votes each trait received, and as to the ranking of every trait that received a vote or votes in the 1–20 scale (*Summary B*). Our present report is but a preliminary one. We shall make a second check on the twenty-odd traits selected in this

SUMMARY B

The twenty-two most important traits selected by seventy-nine dental teachers throughout the United States, and their ranking compiled by three different statistical methods, with a final or order-of-merit listing of these selected traits

TRAIT NUMBER*	NAME	L.F.	M.W.	PER CENT	AV.
		1	2	3	RK
17	Honesty	1	1	1	1
10	Accuracy	2	6	9	5.6
4	Tactfulness	3	5	3	3.6
8	Industry	4	2	8	4.6
5	Good personal appearance	5	4	13	7.3
34	Possession of good habits	6	8	5	6.3
23	Sympathy	7	10	4	7.0
13	Self control	8	9	11	9.3
29	Refinement	9	13	6	9.3
12	Keen observation	10	11	12	11.0
6	Initiative	11	7	14	10.6
7	Patience	12	12	7	10.3
42	Punctuality	13	15	10	12.6
9	Resourcefulness	14	14	15	14.3
25	Precision	15	16	20	17.0
1	Robust physique	16	17	19	17.3
3	Good memory	17	18	18	17.6
24	Open-mindedness	18	x	16	17.0
45	Analytical-mindedness	19	x	17	18.0
19	Courage	20	19	x	19.5
27	Neatness and orderliness	x	3	2	2.5
35	Self assurance	x	20	x	20.0

* In *Summary A*.

first study. A list of these traits will be sent to one hundred dentists who have been successful in their practices. The traits selected in our final analysis will have their respective trait actions carefully described, using synonymous terms so that the subjective element will be replaced by the objective element in judging an individual as to

the amount of any given trait he possesses. The final product should represent a fairly accurate means of measuring a dentist's personality based on a hypothetical personality set up by fellow dentists.

The importance of using psychological tests in the various professions is becoming more apparent. The Minnesota Tests for Mechanical Aptitude may have an important bearing on the study of dental students in their freshman year. Mechanical aptitude is important in our work, and the utilization of these tests, as an adjunct to our technical instruction, may be of great value. The time has come when each teacher must study his students as individuals, and not en masse. Department heads in our dental schools should have a personality profile of each student under his supervision, which is a composite of the opinions of the members of his staff, for his judgment alone is too likely to err in many cases. The careful use of personality rating-scales would give the department head and each member of his staff a "blue print" of each student as determined by a group judgment.

The extent of one person's inconsistencies in trait action compared to those of other persons, in regard to certain actions, responses, and situations, marks the degree of dissociation of our personalities. In other words, it denotes how far we are from the desirable integrate or normally successful personality. The individual who possesses this integration has sureness and effectiveness, and puts behind his actions his full drive and force. Integration is not given, it is achieved. The aid and help we as teachers can give our undergraduates, to develop a successful personality or full integration, will be a satisfaction to us, for our success is interdependent upon the success of our students. We, too, will then have attained the end or object desired, success.

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DENTAL EDUCATION[1]

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I. INTRODUCTION

When I was invited to come here tonight it was suggested that the subject of the past, present and future of dental education be discussed. This is a large subject to cover. Since the whole of it cannot be condensed into a brief presentation, I have touched only the fringe here and there. In order that the subject may be discussed intelligently, we must first have fixed in our minds the object of dental education, which is primarily to prepare men and women by a thorough and comprehensive training in dental schools for the intelligent independent practice of dentistry. This, I believe, has always been its purpose. As the scope in the field of dentistry enlarged and the dentist assumed more responsibilities, dental education met the challenge by raising its requirements to meet the new conditions. It will not be the purpose of this discussion to promulgate or exploit any preconceived or original ideas in regard to alterations in present-day dental education, or to discuss the technic or detail of curricula in which dental educators themselves are so much concerned. Rather, my remarks have been predicated upon the assumption that most of

[1] Read at a meeting of the New York Academy of Dentistry, Yale Club, New York City, February 26, 1931.

the members are interested in the subject from a broad or general viewpoint, and are not particularly concerned about the number of semester hours in the various subjects required in the pre-professional years, the prerequisites for the professional course, or the number of scheduled hours in the various subjects.

It is obvious to anyone who is familiar with dental education, that it is now passing through a serious transitional period, through the same evolutionary process that was experienced by medical education—a process in which medicine is still embroiled, so far as that is concerned. Although dental education has seen a remarkable advance in the last decade, a balanced course to meet all present conditions has not yet been developed.

II. PAST

Any attempt to discuss the past of dental education necessitates a determination as to when dental education began. Necessarily it began when dental service was first rendered and that certainly predates recorded history. Neither is it possible to set a definite date when the dental profession began. There are many milestones in the history of dentistry and anyone of several of these might be taken as the beginning of a dental profession. A logical date from which to start was when, in Paris in 1700, there was instituted an examination of proficiency for those who desired to practise dentistry. Since that year some men seem to have been trained specifically for dental practice. Such training was by the apprentice system. In many cases the apprenticeship was mingled with or preceded by part or all of the training usually given to those who planned to practise medicine. The apprenticeship method persisted in dental education until some fifty years ago and in some modified sense is found in the clinical instruction of our present-day schools. However, today the term "dental education" is usually understood to mean formal institutional instruction in dentistry. For this we have a definite date of inception; namely, 1840, when the Baltimore College of Dental Surgery was opened. This event was then the culmination of hopes long cherished by men practising dentistry in this country.

In the year 1818, almost a quarter of a century before this event occurred, Elezar Parmely urged in a printed paper the establishment

of a school to train surgeon-dentists as they were then called. He was one of the most prominent practitioners of his time and it must be conjectured that this formal printed recommendation had been preceded by suggestions of such procedure long before this date. The course of instruction in the Baltimore School extended over a period of sixteen weeks. There were four men on the faculty, two dentists and two physicians. Lectures were given in anatomy, physiology and clinical dentistry, but there was no practical instruction. The second dental school, the Ohio College of Dental Surgery, was organized in Cincinnati, Ohio, in 1845, and was patterned largely after the Baltimore School. A limited amount of practical clinical instruction was provided for. These two schools set the standards for the beginning of dental education in America and maintained the leadership for many years. Of major significance is the fact that in these two schools were trained the men who most influenced dental education until the close of the nineteenth century. The original type of dental school represented the independent mechanical plan of instruction with required preceptorship. It was not until early in the nineteenth century that the treatment of mouth lesions was given any particular attention in America, although mechanical work had been done and teeth extracted many years before. Paul Revere, silversmith and mechanical dentist, 1775, advertised to make false teeth that were useful in eating and would improve the appearance. In a book published in 1804, Dr. Strickland, of Baltimore, exhibited a comprehensive view of the practice of dentistry. He even had a worthwhile concept of orthodontia. One chapter is devoted to what would now be called focal infections. In this chapter he cites at least two severe cases of rheumatism that were cured by extracting the teeth, after the patients had sought the best medical service then available without results, and urges that there be a better coöperation between the respectable dentist and the physician, as well as between the respectable dentists themselves.

Dentists at that time were divided into two rather well defined groups; namely, the respectable dentist and the charlatan or quack. The latter as might be expected predominated in number. The respectable dentist probably in most cases had some training in a medical school in addition to an apprenticeship under a dentist, while the

quack practised by sufferance only. There were only a few of the better trained men in practice and they were mostly in widely separated areas or districts. However, in those early days the seed was sown out of which both organized dentistry and dental education developed. The first dental society was founded in New York, December 3, 1834, the name of which was the Society of Surgeon-Dentists of the City and State of New York. Following the Civil War there began the organization of another type of school. This was the university school, which was at least affiliated with other fields of education, and especially with medicine, and to this was added in the case of one school (Harvard) a requirement of some training under a practising dental preceptor. In many of these schools the affiliation with other departments of the university was rather loose, so that, in fact, they were quasi-independent; but in these, the mechanical feature was less overwhelming than in the independent schools. There were, however, too few of them to control the trend of dental education.

The next innovation was the school affiliated with the independent medical school, to which in some cases a school of pharmacy was attached. This afforded some interrelation with other types of education; but since the independent medical school was not much better than the independent dental school, the affiliation emphasized and aggravated certain features, especially that of teaching for profit. Schools of this type increased very rapidly, and in number soon exceeded those of the primary independent type and the university school combined. Schools of this type were not only much more numerous than those of the university affiliated type, but they also received and graduated far more students. They inherited the policy of mechanical emphasis that had been characteristic of the independent schools; and since medical education at that time was entirely controlled by the independent or quasi-independent type, the dental schools were strengthened in this policy by being coördinated with the prevailing policy in medical education. The dental schools actually controlled by universities were in a great minority. University control was so slight that probably more than 90 per cent of the dentists who graduated before 1905 were educated in schools where (*a*) the mechanical phase of the curriculum was so largely emphasized as to obliterate almost everything else; (*b*) where profit to the proprie-

tors was considered an entirely worthy and ethical policy; and (*c*) where the control of the school was so nearly independent that the affiliation with other educational institutions meant nothing so far as influence or control over educational policies was concerned. During these early years, the proprietors or officers of many schools resorted to many subterfuges. Advertised courses of instruction were not given at all or only in part. Students were not required to attend full scheduled courses. The same lectures were given at night as in the day, and students were given double credits. Honorary degrees were conferred, requirements for admissions were not enforced, and many other irregularities were in vogue. Such practices continued almost unabated until about 1900. These conditions predisposed to a general deterioration of instruction and a lowering of necessary standards.

In 1900 dentistry, so far as its educational program was concerned, was more closely correlated with medicine than ever before. If the medical educational program had continued at a normal pace of development, dentistry would have had a good chance to come into closer relationship and coöperation with medicine. However, at about this time there developed a very unusual condition in medical education. Its causes are too many and too intricate to discuss here, but they began in 1890 and reached a climax in 1910. This condition resulted in almost a revolution in medical educational policies, involving marked increase in entrance requirements, extension of curriculum, service of full-time teachers, activity in research, and, above all, expenditures that could not be met by dental education, which had not yet been stabilized in its new policy of affiliation with medicine on educational policies and programs. The result was that medical education broke away from the team harness and left dental education standing alone, and restored relations of separation similar to those of twenty years earlier (1880). Dental education thus entered another era of uncertainty and contention from which it did not emerge for many years. In this period, which covered about twenty years, the men actually engaged in dental education were those graduated before 1900, and under policies independent from all other educational influence, with the possible exception of medicine, with an emphasis on the mechanical aspect of instruction and with the policy of profit con-

sidered entirely worthy. It is no wonder that under these conditions opinions were so conflicting that they were incapable of compromise. While all of these things were transpiring in dental education, organized dentistry was experiencing a substantial growth and was exerting a wide influence upon the trend of practice, which in turn was reflected upon the trend of dental education.

Within a few years after the organization of the first dental society in New York, similar organizations were formed in various parts of the country. The most notable were the American Society of Dental Surgeons (1840), which because of dissension and conflict within its ranks disbanded in 1856; the American Dental Association (1859) and the Southern Dental Association (1869). After a few years these two were united under the name of National Dental Association. The first meeting was held at Old Point Comfort, Va. The membership was comparatively small, and continued so for years, although it included most of the outstanding men. It was reorganized in 1913, when practically all state societies became constituent parts. The state societies were then reorganized and established components throughout the respective states. By this action the membership in the national organization has been recruited to almost forty thousand. The name was changed in 1922 to the American Dental Association. The Association's activities extend into every field of the profession. It wields a strong influence in all public-health programs, in legislative matters, in dental research, in dental education, and in the science and art of practice. Running parallel with these have been organizations founded by the members of the faculties of dental schools, the first of which was the National Association of Dental Faculties (1884). All such associations have now been merged into the American Association of Dental Schools (1923). Through the influence and assistance of these organizations, augmented by the urge and necessity for a better and more complete dental service, dental education was materially helped in its advancement. Another factor which influenced dental education was the public control of dental practice. The dental examining boards in most states have maintained a high standard of requirements for admission to license examinations. The members of the board have generally been conversant with the progress in dental education, especially in states in which dental schools are

located, and they have endeavored to change or modify the regulations of the board to meet new conditions as they arose. It is probably true that examining boards at present are operating more intelligently, more efficiently, on a sounder basis, and with a better understanding, than ever before.

Steady progress had been made in dental education until the year 1914, when the world war broke out, which not only had the effect of temporarily disintegrating all educational programs, but upset the minds of men so much that logical and calm judgment became a rarity. The post-war period brought other types of unrest and it was not until about 1925 that matters settled down enough to favor progress in dental education. The main conclusions of the survey made by the Carnegie Foundation had been published and the report was almost complete; the schools had been classified and re-classified by the Educational Council of America; state examining boards had revised and clarified their regulations; university affiliations had been made by nearly all of the schools; entrance requirements had been advanced in many; commercial or independent schools had almost been eliminated; and education run for private profit was about to end. There were, however, two rather disconcerting obstacles; namely, insufficient funds and the development of several different plans of education. There were especially the "nought-four," the "one-four," the "two-three," the "two-four," and several other combinations. None offered a panacea for all ills, although the proponents of some of them seemed to think so. This situation caused much confusion among dental educators and retarded progress to a considerable extent. The two combinations which have been most enthusiastically promoted, i.e.; the two-three plan and the plan making the first two years of instruction entirely medical are incompatible, and in this fact is a hopeful sign, since they will probably neutralize each other, for it is certain that they cannot both be applied at the same time in the same institution. Each of these innovations has some merit, but it is not universal. There is as yet no evidence of a panacea that will cure all of the evils of dental education. Panaceas are more likely to be harmful than beneficial, and if promoted beyond a reasonable point, what may happen then, will be in the lap of the gods. Panaceas, political, religious, social and medical are as old as written history. They arise,

become fads, and finally sink to forgetfulness. There is no reason to believe that any different fate awaits an educational panacea.

The dental education of the past is behind us. Its history has been made and we cannot change it. In it are many things in which we can take pride, but also many things that we know now were unfortunate mistakes. In it can be found guides, both as to what to do and what not to do, and we should learn to profit by the lessons of the past, even though some of them were very bitter.

III. PRESENT

At present dental education and the dental profession are confronted by many serious problems, upon the solution of which will depend in a large measure the trend of both. Some of the major ones that may be mentioned are as follows: finances, general economic conditions, increased requirements, maintenance of standards, research, specialization, instability of dental faculties, various plans of education, graduate or extension courses, inefficiency of teachers, preventive dentistry, lay education, state dentistry, adjustment of service in an enlarged field, legislation, obligations to public health-service and programs, social and civic responsibilities, children's dentistry, an equitable balance between dental needs and dental service, and a proper adjustment between dental service and dental fees, a better knowledge of dental needs in all communities large and small alike. A clear and comprehensive understanding of all these things must be had and taken into account before deductions can be made and conclusions arrived at regarding alterations in our present plans of education; and when they are all "ironed out," changes may be made that we cannot now anticipate. This work cannot be done by one man or a small group of men, but must encompass large groups, whose interests, if not identical, are closely related. It is only on reality that any power of action can be based. The first thing to be done is to lay down the purpose of dental education. Second, any plan or policy must be logical and workable, not only in one locality but in many localities. To discuss dental education on the basis of very large endowments which are not available, and are not likely to be as long as present conditions continue, is rank futility. No plan or policy that exists only by reason of the attachment of the name of some individual

of prominence can survive very long. Any policy must stand on its own merits and be able in itself to appeal to the majority of people, professions, laity and philanthropists. If after a reasonable time it appeals to only a few and gains no considerable number of new adherents, it has become static and might as well be abandoned. It is comparatively simple to build castles in the air, but the proposition resolves itself into a different problem when it becomes necessary to build houses with the materials at hand.

There are at present at least three different types of faculties under which dental schools are operated; namely, (*a*) a medical faculty, to which a limited number of dental instructors of professorial rank are appointed; (*b*) a faculty composed of dental instructors, to which no instructors in the medical school are appointed; and (*c*) a mixed faculty, composed of all dental and medical instructors of professorial rank who teach dental students or in whose departments dental instruction is given. It is reasonable to assume that in each case the type of organization adopted best serves the purpose in that particular institution. It is probably true, however, that in the first type, the policies of the dental school are largely under the control of the medical members of the faculty who are in the majority. In the second, the coöperation might not be close because of probable lack of sympathetic understanding between the two groups, dental and medical. The last type seems most desirable, since it affords all those who teach dental students an opportunity to become better acquainted with the problems of dental education and to participate in deciding policies of the school. This plan is followed in the school with which I am associated. Its operation has been entirely satisfactory, and has brought about a closer relationship and better understanding between the members of the two professions than could have occurred otherwise.

The proposal has been made that dentistry become an integral part of medicine, that the present plan of teaching dental students be abandoned, and that dental instruction be a department in the medical school and thus come under the supervision of its faculty. This proposition was probably projected with the thought that it would solve some of our problems, possibly the teaching of the basic medical sciences. In my opinion the divergence between the requirements for

the respective practices of medicine and dentistry is too great to justify any serious consideration for such an idea. Neither do I think that complete medical-faculty control is much to be desired. The dental men certainly understand their problems best, and too much outside interference would not be conducive to the best results. Medicine would probably be pleased to adopt dentistry now, since it is a full-grown and healthy child, although considered by it an illegitimate and puny one only a few years ago. The inquiry is now being made as to how much more medicine should be taught dental students. I think it would be pertinent to inquire how much dentistry should be taught medical students. If there is to be a closer coöperation between the physician and dentist in practice, this question becomes important. Unfortunately, speaking in general terms, the dentist has an inferiority complex when in consultation with a physician, although the dental student is receiving a better education in the medical sciences today than the medical student received a few years ago. The dentist understands mouth lesions better than the physician, and has at least an intelligent conception of the diseases of the whole organism that are in any way related to his practice. I think we are wont to criticize the dentist too much and place the physician on too high a pedestal by comparison. It is not unusual to have a physician display gross ignorance of pathological conditions about the mouth and teeth. It has been my observation that the dentist suffers none by comparison when it comes to efficient practice in the respective fields. It is probably true that the practice of dentistry is more exacting than that of medicine. It certainly requires more skill. A noted internist lecturing to his class in medicine one day said: "One of the important things for you to remember in the general practice of medicine is that of all of the patients who may apply to you for treatment, 80 per cent will recover of themselves if you do not interfere with nature's law too much, 10 per cent will die no matter what you do, and the other 10 per cent can be improved or cured by proper treatment." Such an analysis would be useless in its application to dental practice for, in this, practically every person who consults a dentist is a potential patient in need of service.

Another reasonable inquiry when considering a well balanced course: Should dental educators take into account the present status of the

practice of dentistry in regard to that part which pertains to the reparative and its relative per cent in practice, and that part which may be called dento-medical and its relative per cent in practice? An ultra-conservative estimate now would be 85 per cent and 15 per cent, respectively. The estimate generally has placed the reparative work above 90 per cent. This question has been given some consideration, perhaps not enough; opinions differ. Some claim that an acceptable balance would be a division of the curriculum so that 40 per cent could be devoted to instruction in the medical sciences and 60 per cent to instruction in the clinical subjects. I doubt whether any schools are operating exactly upon this basis. Some may have a 35 and 65 per cent division. We have a little less per cent than that. The exigencies which are almost constantly arising in actual practice modify its requirements and should command consideration in dental teaching. The scope of practice is enlarging along certain lines and diminishing along others. Dental educators should take cognizance of this fact, and immediately inquire whether it is the function of dental education to set up requirements to be met by the general practitioner, or whether the requirements of practice should be met by dental education.

The purpose of dental education is certainly to educate dentists. Teaching, therefore, is primary and research ancillary to it. Research is highly desirable and may be carried on in the same institution by men who are also teaching, but administrative procedure must be established to maintain a balance between teaching and research, else the teaching is likely to become subordinate and degenerate. One of the great fallacies dominant in some of the educational institutions today is that efficient teaching is dependent entirely upon the amount of research that is being carried on. This unrestricted statement is not true in fact. Up to a certain point research does aid in teaching but if left unbridled, because of its attractiveness to the worker, it is likely to become so much emphasized that, if not restricted, it may lead first to unbalance in teaching, next, to disparagement, and finally to neglect; so that the instruction of students from a research man may become far more perfunctory than is likely from a man who does no research, but who applies the results of it to his teaching. Please do not make the interpretation that I am depreciating the value of good

research; I am not. It may prove the salvation of dentistry, but I do not believe that, in an institution where teaching is paramount, teaching should be subordinated to mediocre research, nor do I believe that the quality of an institution should be judged entirely by the amount of research that is carried on in contradistinction to the quality of men it graduates. Good dependable research is necessary and may be invaluable, but mediocre research is only an expensive luxury.

If, then, the primary purpose of dental education is to prepare dentists, the next proper question is: For what are students to be prepared? Of the students in any school there are a few who of their own volition will engage in research after graduation—5 per cent is probably a generous estimate of the number who will do any serious investigation beyond recording clinical observations. Also of these students, there are a few who will become teachers in dental schools and a few others who will turn to specialization. Since there are now less than 2000 graduates a year and only 38 schools, the number who are likely to enter a teaching career is comparatively small. Probably not more than 10 per cent of the graduates in 1931 or in any of the years of the immediate future will go into teaching, research or specialization; 90 per cent will probably engage in the general practice of dentistry. The educational program, then, must in nearly all of its features be directed toward educating and training this larger group.

The next question is: In what locations should dentists be educated to practice? Here must be taken into account service to the public. The large majority of the people reside in cities of less than 50,000 population. Dental service is needed in the small rural districts and suburban communities, as well as in large urban centers. Therefore, the major purpose of dental education should be to prepare dentists to enter general practice. Our efforts must not be directed solely to the benefits that will accrue to the profession, but on the contrary the larger influence should be service to the public. If we fail to meet that obligation, there will probably arise another group outside of the profession who will attempt to do so. It is not likely that the dental profession can force the public to meet its demands. Rather, in the final analysis, the public will compel the profession to make such adjustments as will fulfill its requirements. A precedent has already been established in Tennessee, where a law was enacted that provided

for the licensing of persons to practise dentistry in counties of 12,000 population without having received instruction in a regular dental school. Any graduate from a "mechanical school" is eligible to apply for and to receive a license without the trouble or inconvenience of taking an examination of proficiency. I understand the primary purpose of this law was to apply only in one county, in which there was no practising dentist, but it is a well established fact that a license for limitation of this kind cannot be confined or restricted to a single geographic jurisdiction. Since a majority of the people reside in rural districts and suburban communities, a large per cent of the future dental graduates must practise in localities of less than 50,000 population, if the dental needs of the public are to be served and satisfied. Any dental educational policy that does not take this situation into consideration is illogical, and will fail to meet its full obligation. The conditions in New York City, for example, cannot be taken as a basis of the argument. The character of its population, so largely foreign and predominantly of a social group that adheres closely to large urban communities, makes the conditions of the New York dental schools the least typical of any locality in the country. Hence citations and conditions in dental education and practice in New York City cannot be taken too seriously in formulating an educational program for application throughout the United States. Group practice, whether by a group of specialists or by a super-dentist with a bevy of craftsmen assistants working under him, will not solve the major problem.

A careful survey of the things which the general practice of dentistry should encompass leads to the conclusion that a full medical course of instruction, preceding instruction in dentistry, is quite unnecessary to fulfill the requirements of present-day practice. The expense alone makes such a procedure almost prohibitive, and would bring about a greater economic unbalance between dental service and its cost than now exists. If dental education leads its students to believe they are super-dentists, or if by establishing graduate schools in connection with every dental school, it tries to make a specialist of every dentist, the cost of preparedness for practice will so increase that its graduates will neither be willing to enter general practice nor serve people living outside of large urban centers. We should profit by the experience

of medical education. Medicine has engaged in specialization to the extent that the general practitioner is a rarity. The services of a series of specialists, whether in a group or located independently, has become so expensive that the people are rapidly turning to the cults. The osteopath, the chiropractor, the electro- and hydro-therapists, and many other cults, although only having a license to practise within a limited field, have enlarged that field and are now carrying on a large part of the general practice of medicine. While the medical specialists who might have been good general practitioners sit in their offices waiting for the occasional patient. Dentistry in its several parts was practised by various craftsmen through many centuries, and unless a sane and rational educational program is followed, such a condition seems again imminent.

IV. FUTURE

At a recent meeting of the American Naturalists, in Cleveland, Prof. E. M. East of Harvard said, in a symposium on the future of the human race, that he proposed to indulge in the realm of speculation, and did not think it necessary to give any reason for his opinions, since speculation was a harmless amusement and its validity could neither be approved nor disapproved. The beginning of knowledge is speculative. It indicates mental craving for the unknown. When properly restrained it has distinct value, but when followed too far it leads into metaphysical vagaries that confuse rather than aid. The first step after speculation is the organization of an hypothesis. This must immediately be put to an experimental test or abandoned. Prophecy is different from speculation. It commits the prophet to something in the future and, therefore, necessarily unknown. It is illogical unless comparable conditions in the past can be so associated as to carry a parallel course of events to a similar conclusion. Prophecy cannot be gainsaid at the moment, but the wise man will put the culmination of his prophecy so far in the future that it will either be forgotten, or the prophet will be dead and thus escape any embarrassment if the predictions fail to come true. It has been said that wisdom is the efficient administration of things unforseen. In the present condition of unrest, confusion, loss of confidence and economic distress, with mob psychology and herd

thinking in the vanguard, and sound judgment apparently in the descendency, with the whole fabric of the country more or less disintegrated and everything passing through a period of readjustment, I do not see how anyone can make a forecast of the future with the slightest degree of confidence. If anyone had predicted a few years ago that we would now have prohibition, and that the present state of affairs would exist, he would have been regarded as a lunatic. In dentistry take the single factor of x-ray diagnosis. A prophecy made before the discovery of the x-ray could not possibly have given an adequate picture of present-day practice. I do not care to prophecy on the future of dentistry or dental education, but will indulge briefly in the amusing pastime of speculation.

Dental education and dental practice are so closely interwoven that anything which affects one unquestionably affects the other. While the future of dental education depends upon the trend of dental practice, conversely dental practice will be profoundly influenced by the degree of sanity in dental education. Both will be influenced by education of the public. Programs of public health, of which dentistry is a part, are being more widely and enthusiastically promoted. Dental health-education in public schools is progressing at a rapid pace. The White House Conference on Child Health and Protection includes a large dental program. Lay education through the press is becoming more popular and effective. Welfare organizations are spreading propaganda on dental health-problems. The medical profession is fast recognizing the need for dental service. One may therefore predict with fairly good reason that the demand for dental service will increase accordingly; it may become overwhelming. If so, are the dental profession and dental education prepared to cope with the situation? Do not underestimate public opinion and the recourse to the laws of the country. The Tennessee precedent should be a shining example.

Dr. W. J. Gies, in a paper read in Chicago recently, distinguishing between the actual *demand* and the actual *need* for dental service, stated that the *exhibited demand* was in his opinion being adequately met by the present number of dentists, and that the influx of new graduates was practically sufficient to cover both the annual retirement of practitioners and the increase in exhibited demand for dental

service accruing from the growth in population. But, he said, the *real need* for dental service presented quite a different problem. His estimate that only about 25 per cent of the population are receiving adequate dental service seems to be a fair deduction. The manner in which the other 75 per cent will be cared for is a question to be solved in the future. Part of the solution may lie in preventive dentistry. Based on our present knowledge one is warranted in saying that the phase of dentistry most likely to advance is preventive dentistry and in education it should correspondingly receive more emphasis. I cannot tell just when, but probably sometime in the near future it will be the major subject of the curriculum.

If a dental educational program becomes dominant in which every recipient of a dental degree must take a graduate course before he is fitted to practice anything, and then can practice only a specialty, or if every man before he can study dentistry must graduate in medicine, we will see an end to the dental profession as such, to be succeeded by a few super-physician-dentists and a host of cults and artisans. This condition will be amplified and hastened if an attempt is made to educate men on different levels in the same school, and then to initiate laws which provide a license for the limitation of practice within a circumscribed area. It has been the experience in the case of medicine that a law restricting the scope or jurisdiction of practice within a professional field cannot be successfully enforced. It is predicted upon good authority that a vicious attack will be made on the medical practice act in Ohio this year. It is anticipated that the Legislature will be asked to exempt religious-faith healing from the provisions of this act; that the osteopaths will attempt to have the present legal restrictions on the practice of osteopathy removed, and that the chiropractors will endeavor to obtain additional special privileges for the chiropractic practitioners. Another proposal which will undoubtedly be made is to create a state examining and licensing board for cosmetic therapists, beauty-parlor operators, hair dressers, barbers, and similar artisans. If this proposed legislation is enacted, it will legally authorize these groups to treat various conditions of the skin and scalp, and probably render such other medical service as they may desire.

Dentistry has so far experienced only two departures from its regular practice; i.e., laws for the licensing of dental hygienists and a law

in Arizona separating orthodontia from dentistry, the object being to set up orthodontia as a distinct profession. The result however would be the establishment of another cult. If this application can be made to orthodontia, it can just as well be related to all other specialties of dentistry. I believe that any reasonable or sensible person will agree that such a procedure forbodes evil and is fundamentally wrong. It is unfortunately the opinion of some influential persons that professions can be legislated into existence. Such a belief is more than absurd; it is even foolish. The standards of practice that should be maintained, and the service that should be rendered to the public, cannot be erected by this method. The practice of any specialty of dentistry should be preceded by a good comprehensive general course in a high-class dental school, and in addition to this a few years of experience in general practice is most desirable. I predict that laws will be proposed and may be passed which will entirely change the present status of dental practice, unless the members of the profession and dental educators pool their strength, consolidate their efforts and influence, and prepare to meet the situation in a sane, logical, and efficient manner. I have confidence, however, that there are enough men in American dentistry who will keep their feet on the ground and prevent such a catastrophe. Speculation as to the future is harmless, but one major effort in dental education and dental practice should be so to apply our knowledge from the experience of the past that a repetition of errors already made will be avoided.

V. DISCUSSION

Alfred Owre, D.M.D., M.D., C.M., B.A., D.Sc. (New York City): It is always a pleasure to indulge in an academic discussion of one's chief indoor sport. It is impossible for me to discuss every point raised by Dr. Casto's interesting paper. A number of his statements, however, seem to me to call for quite a little argument. It cannot be flatly assumed that the object of dental education, as he says, is *per se* to prepare students, in dental schools, for the independent practice of dentistry. No form of education is self-limited. Dental education, like any other phase, is subject to constant change and development, to evolution. Its evolution is naturally bound up with that of medical education, since it concerns living tissue. Dentistry must be regarded and discussed as a department of medicine and surgery. Dental education like any other must be worked out by men in

the field—that is by dental and medical educators acting for the universities. It is not a matter for the mass of men practising dentistry, nor for cloistered phrase-makers who dislike to see their word-pictures disarranged. There is, too, a more pertinent aspect than the one given, of the classical Baltimore separation. Dean Noyes of the University of Illinois dental school has this to say on earlier dental colleges:[2]

"Hayden and Harris did not ask to have dentists made out of doctors, but for a co-ordinate relation of medical and dental schools. The essayist points to the attitude of the Medical College of Indiana in 1879. All of the early dental colleges had more medical men than dental men on their faculties, and it was this influence that made a profession of dentistry. The same reaction which is recorded in the paper was found throughout the country in the attitude of medical men and medical schools, in their coöperation with dental education. I have in mind the Missouri Dental College. Its original faculty was composed of eight men. Six of them were M.D.'s. Only two held the degree of D.D.S. From that school came G. V. Black, Thomas L. Gilmer, James H. Prothero, Patrick, and a great many more that I could recall, if I stopped to think of their names. That school produced more Deans of dental colleges than any other school in America. It did more to stamp the quality of professional development in the middle west, than any other school in the country; and is it not reasonable to suppose that the influence of the medical men on the faculty was an important factor?"

Unfortunately, this influence was too soon diluted. As a natural consequence of the rise of commercialized dental education outlined by Dr. Casto, for the last fifty years dentistry has been overwhelmed with graduates of cheap commercial schools. As Dr. Casto states, they soon supplanted the better trained men. It is these men, largely, who are now in the political saddle; they dictate policies and decide issues. Educated men are in the minority, and their voice is disregarded. "Organized dentistry," under the circumstances, can hardly be expected to take a disinterested or progressive stand in matters of education. Men with the background painted by Dr. Casto are not as a rule able to regard or discuss a question abstractly.

The 1910 climax in medical education referred to was precipitated by Dr. Flexner's survey of medical education for the Carnegie Foundation with the cooperation of the Council on Medical Education. This was an excellent survey, with immediate practical results. It called for sweeping and drastic reforms. It evoked a still-continuing series of large endowments for medical education. Dental education, in consequence of its later history, did not care to keep up. This really explains "the breaking away from double harness." Moreover, with all its other problems, medicine

[2] Noyes, F. B.: Discussion of a paper by Dean Henshaw of the Indiana University Dental School, read before the Chicago Odontographic Society, December 1, 1930. (Quoted from private copy of manuscript; discussion not published.)

could hardy be expected to assume an additional liability of a character so dubious. Medical opinion does not in general regard dentistry as a "full-grown healthy child."

Dean Casto points to the material assistance rendered the advancement of dental education by the American Dental Association and the American Association of Dental Schools. As a close student of dental education for over thirty years—it has been my chief occupation—I must demur. In general, organized dentistry, for the reasons suggested, has been unable or unwilling to regard educational policies disinterestedly, and to act accordingly. The American Association of Dental Schools has done very little to forward dental education, but a great deal of "stalling." It frowns officially on any educational projects not sponsored by the Association and is violently in favor of an autonomous dentistry. My own experience at the last annual meeting is a case in point. At the Toronto meeting last year I was publicly (though anonymously) rebuked by the president in his annual address for having made an informal written inquiry among the deans of medical schools in the United States and Canada as to their views on the proper relationship of dentistry and medicine. His diatribe formed a large portion of his brief address. A committee to report on his address later strongly endorsed his attitude, which, to quote was: "I think . . . . that such a communication should never be forwarded by an individual but by an official body, and only when it carries with it the judgment of the profession." This "third-degree" method aroused so much heated opposition from a minority group of university deans that the endorsement was deleted and the president's original words inserted. Dr. Casto does not mention the work, from 1908 to 1923, of the Dental Faculties Association of American Universities. Yet this was the body which, from its beginning, was primarily responsible for such progress as had been made toward raising dentistry to the level of a profession. It was constantly opposed by various bodies already organized. It disbanded, though not without many misgivings, to merge in the American Association of Dental Schools, during the Carnegie Survey, in a disinterested effort to further the cause of dental education. This now appears to have been brought about as a political move by those concerned with preserving the *status quo* at any cost. Representations that the university point of view, now of course held by a minority, would be respected have not been lived up to. It was the Dental Faculties Association which fought for and secured the four-year dental course; and, despite great opposition, established also the predental year; and in 1919 (with the coöperation of the State Department of Education in New York) required two predental years, to begin in 1926.

I believe it would be very hard to establish the statement that any educational policy must "be able in itself to appeal to the *majority* of people, professions, laity and philanthropists." Ibsen says, "The majority is always wrong." Later in his paper Dr. Casto deprecates the present ascendancy throughout the country of "mob psychology and herd thinking." Education has long been a matter for the specialist; it is shaped and tried out in the colleges and universities. Results of such policies, of course, are ultimately tested by the public—and even by "philanthropists." How dentistry is meeting these tests will be brought out later. There is a certain inconsistency, too, in advocating less emphasis on research in dental schools, and urging increased emphasis on the teaching of preventive dentistry. The oral region has been badly neglected until lately as a field for research. Yet it is only on the results of such research that we can base preventive teaching of any value. Dentistry shares in Dr. Flexner's pronouncement on medical education:[3]

". . . . The requirements of medical education have enormously increased. The fundamental sciences upon which medicine depends have been greatly extended. The laboratory has come to furnish alike to the physician and to the surgeon a new means for diagnosing and combating disease. The education of the medical practitioner under these changed conditions makes entirely different demands in respect to both preliminary and professional training."

Moreover, group practice, i.e., a form of clinic, seems to me to meet many aspects of the present great problem confronting dentistry. Clinics are economical to operate; they afford opportunity for a group of specialists to work together with mutual professional advantage, and consequently to furnish better as well as cheaper service to the patient. And after all, the patient has some rights. (It is possible to consider this question as it affects the welfare of the citizen, though many writers and speakers proceed as though he existed merely to furnish a basis for their activities.) In an automobile age, group practice is bound to extend to country districts as well as throughout metropolitan centers. A professor of law in Dean Casto's own university, writing on "State dentistry—Why?"[4] predicts some form of state dentistry as inevitable. He describes the refusal to recognize this as "the ostrich habit of sticking its head in the sand and thus thinking that it has secured its own safety." He advocates for those who cannot pay, state-supported clinics, and tells dentistry to "get into the picture."

[3] Flexner, Abraham: Medical education in the United States and Canada, A report to the Carnegie Foundation for the Advancement of Teaching (Introduction by Henry S. Pritchett). Bulletin No. 4 (1910), p. 8.

[4] Finfrock, C. M.: State dentistry—Why? *Journal of the American Dental Association*, 1931, xviii, p. 330.

Dr. Casto states further that changes in dental education cannot be made by "one man or a small group of men, but must encompass large groups, whose interests, if not identical, are closely related. It is only on reality that any power of action can be based." On the contrary, as I noted, effective changes are not usually the work of the mass, but of a small specialized group or groups. President Butler, in an address, *Quo Vadis*, expressed this better than I can:

> "Oh, it is so easy," he said, "to run with the crowd; it is so easy to be a coward; and it is so easy to whisper when you ought to shout. The curse of the world today is the dominance of the crowd mind, the mob sentiment, the terrorism of the mass; the number of human beings to stand up on their own feet and in their own name to give expression to their own sincere convictions, to tell where they are going, to give an account of themselves and of their relation to life, is so very, very small."[5]

Large bodies do not initiate policies. A president of Yale University stated once, in effect, that unless honest and intelligent leaders emerged from the mass, democracy was headed for the rocks.

Changes in medical and dental organization and practice are coming fast. Secretary of the Interior Wilbur said at a meeting I attended last week that the next five years will see more such changes in medicine than had occurred in the last twenty-five years. He is chairman, as you know, of the Committee on the Costs of Medical Care. Dentistry, an increasingly important part of the healing art, is bound to be involved. *Leading medical schools, furthermore, are now deeply concerned with the place dentistry is to have in the scheme of education. It is not at all a matter of indifference to them.* I was asked to write an article on the subject, soon to be published, for the Journal of the Association of American Medical Colleges. Anyone interested in my more detailed plan for the experiment will find it there later. I have been criticized for not giving a perfect "set-up" for the ideal dental curriculum of the future. This article goes as far in that direction as I think it possible at present. It is offered in the realization that this must be evolved, not spontaneously generated, and with the expectation that many changes will be necessary. Plato would probably modify his republic if he could see it set up and trying to function. Dr. Flexner has a pertinent paragraph on this aspect of medical education which can be directly applied to dental education:[6]

> ". . . . Progress for the future would seem to require a very much smaller number of medical schools, better equipped and better conducted than our schools now as a rule

[5] Butler, N. M.: Read at the Twenty-ninth Summer Session Convocation, Columbia University, July 12, 1928.

[6] Flexner, Abraham: *Loc. cit.*, p. 11.

are; and the needs of the public would equally require that we have fewer physicians graduated each year, but that these should be better educated and better trained. With this idea accepted, it necessarily follows that the medical school will, if rightly conducted, articulate not only with the university, but with the general system of education. Just what form that articulation must take will vary in the immediate future in different parts of the country."

You are familiar with the attitude of Yale, Rochester, and Columbia Universities toward dentistry. Yale is tackling the question in a scientific way. It is also helping to solve the problem of the transition period. A dentist, for instance, is assistant professor of surgery in the medical school; another is associate professor of pathology in the medical school. Columbia too is trying out an interim plan. Like the College of Physicians and Surgeons we shall advance our preliminary entrance requirement in 1932 to three years of work in an accredited academic college. Over half the hours in the four-year dental course are now given in the medical school. Students have hourly contacts, through the hospitals and ambulatory patients to our clinic, with numerous forms of disease. For the first two years of this course full credit is given a student transferring to the medical school. Several dentists are on the medical staff. Some of these teach medical students. I cite these facts with regard to Columbia not out of vainglory, but as an instance of what, with the generous coöperation of other university schools, and with liberal support from the administration, can be done with "the material at hand." The school is by no means "a castle in the air," and it has been developed with our feet quite firmly on the ground. All three universities are working under large research grants from various foundations—granted on the basis of a scientific approach through medicine. Dentistry will be worked in, ultimately, where it belongs; and it will not be necessary to complete a full medical course and then a dental course to meet the requirements of the training. When this is worked out logically, it will get the financial support it needs—not, I imagine, before. It is not a matter of personalities, or of anybody's name.

Dr. Casto raises the question of how much dentistry should be taught medical students. I think a cultural knowledge of all specialties, the mouth region included, should be required of all students who expect to practise on human tissue, with of course a specialized knowledge in the field finally selected. This is one of the changes that may be looked forward to in a reorganized medical curriculum. It is obvious that an oral specialist will not need all the specific training of the general medical man. He does not need a detailed knowledge of obstetrics, for example, nor of various other specialties. A general cultural knowledge of these would be sufficient for

intelligent practice in the oral region. Quite as clearly, he does need very special training in his own field. I think it is unduly optimistic to assume that "the dentist knows mouth lesions better than the physician." Perhaps, here and there; but how, with the prevailing type of education, can this be generally true? A medical dean told me last week that in his opinion 98 per cent of dentists were unable to diagnose mouth conditions. Clearly neither group knows them well enough as yet. Dr. Rappleye, "Director of Study" for the Commission on Medical Education, and now Dean of the College of Physicians and Surgeons at Columbia, spoke last year of the problem of "making effective use of an increasing body of non-medical personnel, particularly nurses, *dentists*,[7] midwives, physiotherapists, dietitians, social workers, and a variety of laboratory x-ray and technical workers, which has grown up in recent years, as indicated by an enormous development of clinics, diagnostic laboratories, visiting nurse and public health activities, school and industrial medical and nursing and similar efforts."[8]

So much for specific points. There is, however, a larger aspect. It seems to me that in most considerations of dental education we fail to face the fundamental question. Dentistry calls itself a profession. What is a profession? Dr. Flexner in his recent book, "Universities: American, English, German,"[9] has a commentary on this:

"Professions," he says, "are, as a matter of history—and very rightly—'learned professions;' there are no unlearned professions. Unlearned professions—a contradiction in terms—would be vocations, callings, or occupations. Professions are learned, because they have their roots deep in cultural and idealistic soil. Moreover, professions derive their essential character from intelligence. Of course, the surgeon uses his hands; the physician uses a stethoscope; the lawyer uses a clerk and an accountant. But these are the accidents of activity. The essence of the two professions resides in the application of free, resourceful, unhampered intelligence to the comprehension of problems—the problems of disease, the problems of social life, bequeathed to us by history and complicated by evolution. Unless legal and medical faculties live in the atmosphere of ideals and research, they are simply not university faculties at all.

"Professions may be further distinguished by their attitude toward results. The scientist or the scholar who takes shape in the physician or the jurist has objects to accomplish. The achievement of these objects incidentally brings in a livelihood; but the livelihood is, theoretically at least (and for many centuries practically too), of secondary or

[7] Italic not in original.

[8] Rappleye, W. C.: Some medical problems ahead (Commencement address, Cornell University Medical School), *Journal of the Association of American Medical Colleges*, 1930, v, p. 284.

[9] Flexner, Abraham: Universities: American, English, German; 1930, p. 29. Oxford University Press.

incidental, even though to the individual, of essential, importance. Professions have primarily objective, intellectual, and altruistic purposes. A profession is therefore an order, a caste, not always in fact free from selfish aims, but in its ideals at least devoted to the promotion of larger and nobler ends than the satisfaction of individual ambitions. It has a code of honor—sometimes, like the Hippocratic oath, historically impressive.

". . . . I have (merely) assumed that persons who have had a genuine university education will emerge with disciplined minds, well stored with knowledge, possessing a critical, not a pedantic, edge, and that such persons may thereafter for the most part be safely left to their own devices. I suspect, if I must tell the whole truth, that persons who sacrifice broad and deep university experience in order to learn administrative tricks will in the long run find themselves intellectually and vocationally disadvantaged. From the standpoint of practical need, society requires of its leaders not so much specifically trained competency at the moment as the mastery of experience, an interest in problems, dexterity in finding one's way, disciplined capacity to put forth effort. Lower or special schools or experience itself will furnish technique, if that is what students desire."

If we examine the average dental training in the light of this distinction between a profession and a vocation how does dentistry come off? Not, as a rule, too well. How many dentists have a liberal education? How many are really trained in the sciences, with a scientific attitude toward their work? How many treat the mouths of their patients with regard to the possible systemic consequences of their operations? How many could if they would? Out of the many thousands of dentists in this country, we must answer, "Only a very few." An examination of dental literature and of much so-called "dental research" will show this. The emphasis, in our professional journals, is too much on "dental economics," too little on ethics and sound professional lore. Many of the "scientific" papers published at such length are merely ridiculous—or worse. A man can be dropped out of a teaching job, shown up for a sham scientist, and still have his work solemnly printed by dental journals, and no doubt as solemnly read and followed by many of its readers. There is often too little critical selection; too much picayunish bandying of personalities. Of the openness to discussion, the freedom of ideas, that are supposedly characteristic of professional journals, there is not enough. A writer who ventures to question a fundamental aspect of the present system is "published" most unwillingly, if at all, by the journals representing "organized dentistry."

We pride ourselves on our "technique;" but technique does not make a profession. Dr. Flexner writes of this:[10]

"The moment a real idea has been let loose, the moment technique has been developed, mediocrity is jubilant; the manufacturer of make-believe science flourishes. Learning has never been free from pedantry or from superficiality. But the modern world, what

[10] *Loc cit.* (footnote 9), p. 25.

with its abundant facilities for publication and its ridiculous fondness for 'learned' degrees, groans under a tropical growth of make-believe. Now as against this tendency towards specialization of a mechanical or technological kind, we need to remember that universities depend on ideas, on great men. . . . .

". . . . The kind of work that such universities should do requires proper conditions—books, laboratories, of course, but also quiet dignity, freedom from petty cares, intercourse at a high social and intellectual level, and a full and varied life, nicely adjusted to individual idiosyncrasies."

Dr. Flexner, incidentally, does not believe that dental education belongs in the universities; and if one candidly estimates it as it is now generally conducted, one must admit that he is for the most part right. But it can and should be made worthy of a place in the universities. Considered in the light of modern knowledge, the oral region is not a neat little field set off by itself for the convenience of dentists. It is a region vitally tied up to the whole organism, and, from a diagnostic standpoint at least, very important in the early detection and treatment of disease. What is done to the teeth alone is of vital importance to the patient's general health. A responsible worker in this region needs all the scientific background any other physician needs, plus some very special training. Dr. H. W. MacMillan in the *Dental Summary* wrote trenchantly on this issue six years ago:

". . . . Dentistry never will appreciate the rôle of the mouth in its relation to the general economy until the dental student studies the underlying principles of medicine as thoroughly as the medical specialist studies them before he takes up his special field. *Abbreviated courses in anatomy, pathology, physiology, chemistry, and other fundamental subjects never will turn out anything more than an abbreviated product.* [Italics mine.] All students in any way related to the healing art must have the same preliminary training, must pass the same examinations, must possess in the end the same academic or professional degree, or else there will be as great incongruity of opinions and practices as there are differences in the mental training necessary to arrive at those opinions and practices.

"The problem of dental foci of infection is unsolved. Orthopedists have a whole lot more to learn about bone regeneration. Calcium metabolism offers rich rewards in research. Pyorrhea (so-called) in spite of all its cures, is still with us. These problems and countless others are not problems of medicine or dentistry alone but of science in general. The difference between medicine and dentistry should be no greater than the difference biologically between similar tissues elsewhere in the body."[11]

Dr. L. F. Barker, a Baltimore physician, stated last March, in addressing a combined meeting of the Academy of Medicine of Cincinnati and the Cincinnati Dental Society:

"If medicine has to deal with all varieties of departures of the human organism from health, and if dentistry has to deal with the particular departures of the teeth and the

[11] MacMillan, H. W.: The consideration of some medico-dental problems, *Dental Summary*, 1925, xlv, p. 198.

tissues about the teeth from conditions of health, it is obvious that dentistry must be looked upon as a special department of medicine, which became more or less divorced from general medicine mainly on account of the extensive practical-technical manipulations that must be learned for successful practice of dentistry and partly because of the fact that one who specializes in dentistry can have but little time for the practice of general medicine or of another medical speciality."

Logically planned, dental education would become part of medical education, with the advantages, incomplete as they are, and the earned distinction that rightly pertain to such training. But dental education at present is not logical. The thing it is responsible for turns out to be neither wholly a profession nor wholly a technical calling. It tries to be both, but succeeds in being neither very well. Let us face this fact; let us struggle to put our education on an honest basis. This would mean fewer specialists, or doctors of dentistry; these, however, would have earned the right to the title "doctor." It would mean more technicians, who should be responsible to the specialist. It would, moreover, save a great deal of money. Consider the ground now included in the term dentistry. Oral diagnosis; oral surgery; orthodontia; operative dentistry; prosthesis; crown and bridge work; and periodontia, to mention only the most obvious divisions. How can one man be expected to know and practise all these? It is absurd. For diagnosis medical science is needed. Orthodontia is essentially a branch of orthopedic surgery; oral surgery is a part of surgery. Both require the fundamental training of a surgeon. Of the other divisions, many phases can be performed by technicians, trained in a fraction of the time we now spend to turn out the impossible "general practitioner." Why the objection, aside from vested interest, to a more logical kind of education? The doctor of dentistry should be in a real sense a doctor, fitted by training to diagnose and prescribe for this vital region, and to supervise and be responsible for a group of trained assistants, like any other specialist. Perhaps the threat of changing laws Dr. Casto mentioned at the close of his paper is an indication of a need other than that the "members of the profession and dental educators pool their strength, consolidate their efforts and influence" to preserve the present scheme. Perhaps the present status of dental practice *ought* to be changed, in the interests of all concerned. In such case we should do well to pool our efforts to that end, rather than be forced to accept changes variously evolved by technicians, medical educators, economists, and the long-suffering public.

We do not even do all our technical work well. Anyone who sees much of it knows this. Nor do we serve more than a fraction of the people—from, I am variously informed, seven to fifteen per cent receive dental

service. In short, dentistry as a profession has precious little to boast of. A good many people—dentists, doctors, laymen—are aware of the deficiencies of our present system. A dentist wrote recently, in a very intelligent article on "Technician versus Dentist:[12]

"Dentists have expressed the fear that the (dental) laboratory worker will be permitted the privilege of working directly for the patient. Well, why shouldn't he? Surely mastery of impression-taking will require but little effort. I understand that even now certain laboratories have experts in this field only to serve the dentist who cannot obtain a satisfactory impression of the area he is attempting to restore. Where is the logic or justice in a dentist figuring up the laboratory cost of an appliance and then multiplying by four (the accepted number) and quoting this figure to the patient?

"The laboratory man knows that the average dentist would be unable to practise if the laboratories' services were removed.

"The question arises—how long will all this continue? How long will public obliviousness to prosthetic work continue where our prosthetic work is shrouded in mystery and our presentation of service is not, strictly speaking, above board? Can we continue to send impressions to the laboratory and receive back the completed article, then blithely tell the patient that our service is worth four times the fee for constructing the case? . . . .

"Courts look at professional problems, curiously enough, with a lay mind. They have a disconcerting way of failing to see the professional side of the question, hence the presence of that thorn in the side of organized dentistry—the advertiser. If dentistry cannot obtain legislation to eliminate that type of thing, I see where a technician with sufficient initiative might succeed in obtaining court action favorable to his working direct for patients."

This is significant in connection with the Tennessee enactment cited by Dr. Casto. Two instances out of many I know of give this strong support. A woman came to my office who had had a dental bill of $6,000, of which $1,500 was for a so-called small removable bridge made by a laboratory. The laboratory, it proved, got $100. Incidentally, all her work had to be done over. A second case was a local lawyer's wife. She had been charged $700 for a two-tooth "removable bridge." It could not be worn. Her husband traced this back to the laboratory. He was convinced that if the laboratory man had taken the impression, he could have made a better fitting appliance; also that if he could have made the diagnosis he would have used a quite different appliance. Several dentists concurred in this. Incidentally, the article suggests that even our much-vaunted technical training is not always all it might be.

As to the scientific training offered in many dental schools, the less said the better. It is often below good high-school grade; even with good science departments on the same campus, some so-called "university schools" require it to be taken *in the dental school*. Sometimes one man will teach

[12] McEvoy, L. L.: Technician versus Dentist, *Dental Digest*, 1931, xxxvii, p. 96.

four or more fundamental sciences. Not long ago a teacher in a dental school stated in my hearing that there was no reason this could not be done quite adequately. Much of this "science" is not recognized by other institutions, not even by the medical school of the same university. In one such medical school, only one year of *premedical* credit is given for the six years spent by the dental student on higher education. Even the two-three plan is flagrantly violated in some schools. In one, the 60 academic points required by the plan are reduced to 40; "dentistry" is substituted for the rest. It is of interest in this connection that one of the first actions of a group of university dental schools, just organized informally to advance dental education, was to require that there be no duplication of science departments in the dental school on the same campus.

Other signs of awareness to the anomaly of the present system are not wanting. England is trying out a system of "panel dentistry;" it has awakened much discussion in this country, mostly of an adverse sort.[13] One also hears much talk *pro* and *con—mostly con*—dental clinics. In the Ukraine a reorganization of the medical faculties last year placed odontology as one of the four primary groups to be studied in *medical* education.[14] We are not Soviet Russia; but there is much significant rumbling in our current literature against the more obviously preventable evils of medical and dental organization and practice. It would be very short-sighted to believe that the public will always take a system that so vitally concerns public welfare at its *declared face value*. Dean Noyes discussed this at length in the paper already cited.

"What is needed at present (he stated) is honest effort to improve, rather than a smug satisfaction with the efforts of the past. Neither glorification of the methods of the past nor deprecation of present conditions can represent the attitude of the true educator. Careful scrutiny of what has been done and of the present weakness and strength; an attempt to correlate these and to form plans to be tested by the results of their execution can be the only scientific program in education. It is the change in conditions that makes changes in program necessary, and educational methods can never become fixed and final.

"I think the essayist, together with many other writers, has fallen into one of the commonest errors of reasoning, a non-sequitur. He argues that the development of dental technical skill was the result of the separation of dentistry and medicine. Does it follow? Was the development of technical skill the result of separation or of other influences and factors in American Civilization?

"Is it not possible that the same skill could have been attained and other things have been added by a normal relation to medicine? Is it not more probable that the most

[13] Willhelmy, G. E.: Panel dentistry and its antidotes, *Dental Survey*, 1931, vii, p. 30.

[14] Regular correspondent of *Foreign Letters*; Reform of Medical Education in Ukraine, *Journal of the American Medical Association*, 1930, xcv, p. 215.

important influences in the development of the outstanding skill of the American dentist are primarily the same factors as those which have led to a development of mechanical technique in America, which surpasses all the world? . . . .

"An old timer with some humor and some cynicism is reported to have said this: 'In the old days, dentistry was a trade with professional ideals and ambitions; at the present time, it looks to me like dentistry is a profession with trade ideals and aspirations.' There are organizations, the so-called dental economics clubs, even today, trying to influence universities to incorporate in their professional school curriculum courses of salesmanship and bookkeeping. . . .

"The reorganization of medical education was carried out with honesty of purpose. This honesty of purpose has led to a clear distinction between a remaining minority of schools of the proprietary type and those which are endeavoring to advance the standard of medicine. Out of the 76 schools in the American Association of Medical Schools, there is a practical uniformity of ideal and purpose. They may differ, they do differ in details, in their ideas of means of attainment, but their purpose and ideals are unified.

"The reorganization of the teaching of dentistry, as a result of the survey of the Carnegie Foundation, was not carried out with the same uniformity of ideal or with the same uniformity of purpose. I am willing to make the flat statement that the results of the Carnegie Survey have not been carried out in the dental educational field in good faith. . . . .

"Let us look the thing squarely in the face. Some of those schools of dentistry have changed their name, but not their character. There is no change in the plan of their organization nor in the method of their execution. Proprietary interests in dental education have *not* disappeared as you might suppose from that paragraph. A man very closely associated with a dental educator told me within a month that the latter filled in his income tax report last year, a net profit of over $100,000 derived from a proprietary educational institution in dentistry.

"I quote another paragraph: 'All the dental schools in the United States with the exception of three, are now departments of, or definitely associated with, universities and these three are eagerly seeking such connection with every prospect of early success.'[15]

"I have not analyzed them all. I have not made any effort to analyze them, but I can name one institution, advertised as a department of a university which exists only on paper, and the dental department is the only department of the university. The university exists only to the extent that a promoting company undertook to raise the funds for the endowment of this institution, and so far has failed. And still that school is listed as a department of a university. And in a good many others, some others I should say, the university has absolutely no contact with nor control of the educational policies or methods or appointments or finances of the institution, and still they are listed as departments of universities.

"To quote further: 'Of the 38 schools in the United States all require at least one year of pre-dental training and sixteen require two years, either on the 2–3 or the 2–4 plan.

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[15] I recently had an interesting sidelight on the manner in which an independent dental school had sought university affiliation. The dean of the university medical school concerned told me that the heads of the dental school had offered him the school for a quarter of a million dollars. The medical dean's comment to me was: "We would hesitate to take it over as a gift." Such an arrangement is often a liability rather than an asset. It is worthy of note that in less than a decade four university dental schools have closed their doors for lack of endowment.—[*A. O.*].

All of this re-organization has been brought about within the past six years, which would seem to indicate a serious interest and intention on the part of those responsible for dental education.'

"When it was advocated that the entrance requirements for dental training be increased, it was with the idea that what was needed in dental education was a more thorough scientific training in the fundamental sciences, before the student undertook his professional course. To accept students and register them in the pre-dental course in the dental school, on graduation from high school, and give them two years of *university subjects* in the dental school, is *not* carrying out that intention, and it does *not* produce the desired results.

"When the 2–3 plan was first proposed, some of us insisted on pointing out the fact that what was really being done was that of substituting a year of expensive professional training for a year of comparatively cheap instruction in collegiate subjects. The result has *not* had the effect upon dental education that has been obtained in medical education, where that requirement has been honestly and consistently carried out, and where men come to the medical school with two years of pre-professional university training received *before* they enter the medical school.

"The essayist believes that the time devoted to the fundamental sciences in the dental schools compares favorably with that in the medical schools. A survey of the required hours in medical subjects in the dental schools does not lead us very far, for it is almost inevitable that the medical content in the dental curriculum does not spell the same thing in its effect upon the dental student as that in the medical curriculum upon the medical student. The thing that is necessary is a point of view, a realization of necessity, a vitalization of those subjects, so that they become an integral part of the student, and not an ornament or gesture.

"No one wants the dentist to be a physician in the sense of being licensed to practice medicine but only in the sense of considering the mouth as a part of and in relation to the rest of the body.

"If the medical content of the dental curriculum is to be of any value in the development of dental education, it can be so *only* by furnishing the student with a fundamental knowledge of the human body as a living organism. This knowledge is just as necessary for the dentist as for the medical practitioner. No problem facing the dental profession today is as difficult of solution as that of making the medical content of the dental curriculum a *real* thing instead of something which simply has to be got behind them in order to get at 'real dentistry,' immediately to be lost sight of and forgotten as soon as they are in contact with dental technology.

"Medicine has had the same difficulty that dentistry is having. A professor of physiology told me a few days ago that only a short time ago in the medical schools it was almost impossible to get medical students to study physiology seriously. The students thought it had nothing to do with the practice of the art of medicine. One does not find that difficulty today in the medical schools to the same extent. The medical student realizes that if he can not understand pathology, he can have no conception of disease. He can have no basis for the treatment of disease without a real knowledge of the working of the human body. Can we get that attitude in our dental student? He needs it just as much as the medical student. He can have no conception of the pathology of the mouth unless he has some conception of the pathology of the body as a whole. He can have no knowledge of the relationship of the teeth and the mouth to the individual unless he has some conception of the physiology of the individual."

Dr. Noyes then mentions an article of mine[16] which has provoked antagonistic editorials in several dental journals.

"The author of this article," Dr. Noyes goes on to say, "attempts to face squarely the situation in dentistry and offer at least a tentative plan. This should not call forth purely emotional comment. I want to quote one paragraph of the article which is referred to:

'Contrary to widely circulated statements, I have never stood for a "revolutionary" change. To suddenly overset the whole structure of dental and medical education is obviously an impossibility. Like every other educational development, this change must evolve through trial and error. I have stood, and do stand, however, for constructive effort on the part of dental and medical schools, with the end aim of returning dentistry to its former honorable place as a specialty in medicine.'

"Now in no place in this article [Dean Noyes is again speaking], and in no place in writings of similar type that I know of, is there anything which indicates or implies or suggests that dentistry is to be dominated by medicine, that dentistry as a profession is to cease to exist. It does not mean that. You may read it into it, but it does not mean that. It simply means that dentistry as a profession is to return to the relation to medicine as a whole which it normally, necessarily and eventually *must* bear, if it is to be a profession at all.

"One of the editorials asks: 'Incidentally, pray tell us, what use will the "complete" medical course be to the student if it is necessary to take post-graduate oral hygiene, medicine, surgery and then study *real dentistry*?'

"Does that mean that 'real dentistry' is a technical procedure, that real dentistry is the beautiful things that we have heard about? Is that real dentistry? Is that American dentistry? And again quoting: 'The aim and purpose of dental education from its inception has been a specialized professional education intended to properly equip the graduate for intelligent and efficient care of the *teeth and mouth*.' Where does the individual come in? Dental education has too long attempted to take the teeth and the mouth out of and away from the individual. The object of dental education is *not* to train the student in the care of the teeth and the mouth. It is to train the dentist intelligently to care for the relationship of the mouth to the health of the individual. I am perfectly willing to accept the catchword. Catchwords are often mischievous. I have come to be seriously afraid of this one. The catchword is 'A Department of Health Service.' It would be difficult perhaps to overestimate the importance as a health service, of the maintenance of the masticatory apparatus, in its entirety, in its normal function, and in cleanliness, to the health of the individual; but if that is *all* that dentistry is, *then we have no business to take six years to train dentists*. Two years is enough. If all that we have to do is to teach these men to make beautiful restorations, and to supply the beautiful technique of American dentistry, then six years is too much time; but if in order properly to serve the patient with the restorations, the dentist must have a foundation of physiology, anatomy and histology which will give him a view of the functions of the individual and the relation of the functions and health of the mouth to the health of the individual, and the relation of the health and illness of the individual to the illness of the mouth, then dental education cannot be compressed within two years. A fundamental medical training is essential.

"Let us squarely visualize these two conceptions of dentistry; dentistry as a depart-

[16] Owre, Alfred: Is dentistry at the crossroads?, *Dental Cosmos*, 1930, lxxii, p. 1061. (See editorial, same issue.)

ment of health service, which is concerned with the maintenance and integrity of the mouth and the tooth tissues, a technical procedure. If that is the view point, dentistry not only will become but *is* a trade, and the consideration of the health of the individual will go to the medical profession. But if you can take the other conception, that dentistry is concerned with the relation of the health of the mouth to the health of the individual, and the maintenance of the mouth in relation to the health and efficiency of the individual, dentistry *is* a profession. It *is* a specialty of medicine; and our problem is so to educate the students and practitioners in dentistry and medicine that dentistry maintains its normal position and its normal contact, not dominated by medicine but co-ordinate with it.

"If dentistry ever ceases to be a profession, it will not be because it is too closely related to medicine or too closely coordinated with medicine or too closely associated with medicine in education, but it will be because it has been satisfied with an inferior grade of 'health service.' *Truly dentistry is 'at the crossroads.'*"

In all that Dean Noyes has stated here I heartily concur. Defense reactions will not suffice. The situation seems essentially what it was ten years ago. There was then, as there is now, a determined effort on the part of a few of the better university dental schools to advance dentistry, as rapidly as may reasonably be, toward the goal of a specialty in medicine. There is now, as there was then, an equally determined, and much better organized, effort by the vested interests to maintain the *status quo*. Dental education, which had made relatively rapid improvement up to the initiation of the Carnegie Survey, and was then making more rapid gains than ever before, has not, in general, maintained its upward trend. A few of the more flagrantly commercial schools, it is true, have gone out of business. Much lip service has been given to the "university ideal," and many superficially convincing alignments with universities have been recorded. Yet some schools without support except student fees and clinic fees are more prosperous than ever. The bona fide university school, of course, is not wholly dependent on fees; its educational program is based on sound scientific and pedagogic principles. My beliefs on dental education have been so widely misrepresented that I will try to clarify them a bit further.

About ten years ago I was asked for a letter outlining my views on dental education. (This was from the Middle West—not New York. I have never made local conditions in any sense the criterion for my beliefs.) It still expresses my views so accurately that I will read it in part:

"I think 'dental' education—badly misnamed—should branch off somewhere from the tree trunk of medical education, a tree which has for its roots preliminary training in mathematics, physics, biology, chemistry, a foreign language, and English composition. It should have the same relation to the parent stem as does the study of other regions—e.g., brain and nervous system, eye and ear, nose and throat, chest and heart, etc. The specialist in the oral region should have the same standing as the specialist in any other region. His work is essentially vital, involving vital tissue, and requiring thorough bio-

logical knowledge for its proper practice. This is the fundamental necessity—to train specialists in the mouth region, capable of diagnosing and prescribing for ills of the mouth. It were as logical as you [. . . .] have pointed out, to require an eye specialist to make all eye-glasses for which he writes prescriptions, as to expect the oral specialist to fill, clean, or otherwise mechanically treat all teeth his diagnosis finds faulty. It is possible to train men for the mechanical work in a much shorter time than is required for the oral specialist, and in much greater numbers. The latter should work only under direction of the former. Your [. . . . .] analogy of the oculist and the optometrist is obvious.

"The history of Minnesota in medicine and dentistry is interesting. Twenty-five years ago the course in medicine (three years) and that in dentistry (also three years) were practically identical the first two years. The first year the dental student took all the work of the medical student plus dental anatomy and dental technic. The second year they continued to study in common anatomy, physiology, materia medica and pharmacology. The medical students took lectures on the practice of medicine and attended clinics; the dental student had lectures on diseases of the mouth, and did infirmary work. The senior year was devoted on the one hand to the practice of medicine in the out-patient department and hospital, and in attending lectures in medicine and surgery and the specialties; on the other hand it was spent in the dental infirmary and lectures on dental practice. Here we had the beginnings of the right idea. Unfortunately, when the medical school [at Minnesota] expanded, the dental school failed to keep pace. After a few years most of its three years were devoted to mechanical training, with a corresponding loss on the basic side. The recent history you [. . . . .] know.

"Dental education throughout the United States is in a hopelessly chaotic state. It is folly to put all types through the same mill. The mechanical type should be recognized as such, and trained for the mechanical work—two years or less will do it. The scientific man should be recognized as such and given adequate scientific training. If the men nominally trained, in most schools, as expert mechanics—all most dentists assume to be—were actually good mechanics it would be less disheartening. In most schools, however, anyone who can pay the fee and muster, by hook or crook, the legal scholastic requirement for admission is welcomed, with no effort to pick the best adapted. Many hopelessly incompetent men are attracted by the relatively large monetary return, and graduated. The consequence is that a great majority of American dentists are criminally unfit to deal with diseased or malposed tissue. Because the oral surgeon should be familiar with the mechanical therapeutics of his specialty, it would be well for the higher training school to keep the course for mechanics under its wing; the course for the oral specialist should lie in a department of *medicine*.

"This roughly, is my ideal scheme. Its working out lies jointly with the university dental schools and medical schools. It would involve readjustment on both sides, in order to make room for this specialty. As you [. . . . .] know, Sir Hugh McKenzie and Charles H. Mayo, both advocate a modification of the present medical course. This might make it easier for dentistry to fit in."

Nobody is arguing for hard and fast requirements in all details. Conditions, as Dr. Casto remarks, vary with localities. But fundamental principles do not vary. The fundamental obligation to furnish a truly scientific education is the same with all localities.

For my stand on these matters in the past, I have been called various

names, among them "idealist" and "misanthrope." "Alas, poor dean, his only hope was to be called a misanthrope." I do not mind the "idealist," if one accepts a definition that does not preclude the exercise of a little horse sense. For example, "a seeker after the highest beauty or good." But I fear another was intended—perhaps "an imaginative, unpractical person." I do object to "misanthrope." I by no means hate my fellow-man; and on the whole I take a rather cheerful view of life. I regret the necessity of sometimes speaking controversially. "To speak only the truth," said Hi Ho, the sage of Chinatown, "is to earn little gratitude from friends and to increase the resentment of enemies."[17]

The past four years in New York, in spite of much bitter opposition in some quarters, have caused me to admire more than ever the better elements in our profession. Here as elsewhere one finds the worst and the best. Notwithstanding the character of our population, which Dr. Casto describes as "so largely foreign, and predominantly of a social group that adheres closely to large urban communities"—more likely because of this—I have found more professional idealism than I ever found anywhere else. Many students and younger graduates are sensitive to such an appeal, and willing to act on it. And why should not this be true? For those who wish to use it there is a richer cultural and intellectual background in New York than anywhere else in the country. The world of art, music, commerce, letters, science, whirls about our feet. To the true professional student this should mean something. New York can and should develop a model that would serve anywhere. As I pointed out, the automobile has so changed conditions of life throughout the country that there is no reason "communities under 50,000 population" cannot have as scientific and highly specialized a dental service as the great urban centers. The smaller as well as the larger centers are entitled to the best. The senior student's query last year, "Doctor, why don't *we* take the Hippocratic oath?" is a typical reaction of the better class. Here is worthy university material. To dentistry, as to the other professions, university leadership will afford a worthy challenge; and it will be met by *courageous youth*. At the 175th convocation of Columbia University, President Butler made an inspired speech:

"Here on age-old rock [he said in part] at the gate of a continent where land and water meet, where rivers flow and where the homes of men stretch out on every hand so far as the eye can reach, is the intellectual and economic capital of a new nation and a new people, new in time, but old, very old, in inheritance. It draws to itself the ambitious and the

[17] Cited from the *Washington Star*. (Date not available to author.)

downtrodden, the prosperous as well as the less fortunate from every corner of the land, from every nation and from every clime. Upon this modern capital of the newest land of hope and promise, falls the burden of making America real, of transforming the dreams and ideals of the fathers into the accomplishments and the lasting institutions of their children and their children's children for generation after generation. No creed, no race, no tongue, is stranger here. Little Holland, mighty England, dour Scotland, Ireland, Germany, Italy, have all played their part in its building. . . . .

"Today, under the rich influence of these inspirations and these memories, we turn our faces, lit with hope and confidence, toward new accomplishments in the spirit of those ancient ones that can never grow old. Today with strengthened confidence and splendid hope we turn our faces to that everlasting goal which Faith fashions and toward which Knowledge builds the road."

But if dentistry is to meet this challenge, it will have to stop marking time. To those of us with a little militant spirit and training, marking time, as to the soldier, is the most exasperating of all activities. The matter is really so simple. Either dentistry is a profession or it is not. If it is, it must accept the necessity of a genuinely professional education. I apologize, in closing, for the rambling nature of my discussion. Because of his illness, Dean Casto's paper only reached me Saturday. (Continued on p. 431.)

William J. Gies, M.S., Ph.D., Sc.D., LL.D., F.A.C.D., F.A.A.P. (New York City): Day before yesterday I received a copy of Dr. Casto's interesting paper. Last night I carefully prepared a direct discussion of it, intending to adhere closely to the manuscript. But some of the comment you have just heard makes it necessary to meet an unexpected situation. If you will allow me to refer first to several things that Dr. Owre has read, the diversion may be useful.

Comment on Dr. Owre's remarks[18]

The spirit of my reaction to the opening discussion is indicated by this sentence in the statement ascribed to Dr. Noyes (p. 396): "Neither glorification of the methods of the past nor deprecation of present conditions can represent the attitude of the true educator." Certainly in what you have just heard there was practically no "glorification of the past" but there was more than enough "deprecation of present conditions." There was a complete lack of balance and proportion. Since you have heard what might suitably be called "an address by the attorney for the prosecution," a few remarks in fairness to dentistry and dentists, to bring us into balance,

[18] In the revision of the stenographer's report of this comment, the author, supporting general extemporaneous statements, has supplied various quotations and recorded data that were not available at the meeting.

are strongly indicated. I shall begin by being personal as to myself so that you may evaluate what I say. Twenty-two years ago, as the head of the Biochemical Department in the Medical School of Columbia University, I was intimately associated personally and professionally with leaders in the medical sciences and in medicine in this city and in the United States and Canada. I had been occupying positions of trust and responsibility in various scientific and medical organizations, and had the same opportunity to become acquainted with the minds and hearts of active men in the medical sciences and in medicine as, since then, I have had in dentistry and among dentists. As a layman I then, and since have, enjoyed exceptional opportunities to see clearly what was going on in the medical sciences and in medicine, and to evaluate situations therein without prejudice, but in terms primarily of public welfare. When, twenty-two years ago, Dr. J. Morgan Howe asked me to conduct dental research in coöperation with a committee of the New York Stomatological Institute, consisting of himself, Drs. Davenport, Gillett, Merritt, Tracy, and several others, I was like most members of medical faculties—not a bit interested in dentistry. But Dr. Howe's idealism was so persuasive that I could not say no, and "yes" was my answer. Shortly afterward I met the Committee. They looked like physicians and behaved like physicians. In their discussion of the need for research on the prevention of dental caries, they were just as much in the dark as physicians were then and are now on, say, the cause of cancer. And I, the reputed expert in a medical science, like all my colleagues in medical faculties, knew less than they did about the biochemistry of saliva and teeth. I began dental research by learning from them. As I proceeded I became deeply conscious of the fact that most physicians had been ignoring dental conditions; that the teachers of the medical sciences in medical schools, myself among them, had been overlooking the teeth; and that this situation represented a serious public detriment. From that day to this, I have had an increasing desire to serve the public welfare by promoting the advancement of dentistry, and have endeavored to accomplish this in the different circles in which I have been privileged to be active.

I desire now to make a public declaration of faith. Having had abundant opportunity to serve contentedly in the profession for which I had been educated, with a reasonable prospect of having an enlarging share in the satisfactions of increasing usefulness in that field, I gradually though willingly surrendered my place and relationships in order to give my best endeavors to the advancement of dental practice and to the promotion of the dignity, the self-respect, and the usefulness of dentistry, which now constitute the chief aims of my remaining years. I was deeply impressed by the

idealism of the men in this city who, having asked me to coöperate in research, introduced me to the important possibilities in your profession. I have been completely persuaded, by my own observations, that dentistry as a separately organized profession is rapidly evolving toward all that it should become, but that it needs much disinterested coöperation. I have given cheerfully of my own because of the virtues I see in dentistry. In the estimation of many friends this has involved severe and unusual sacrifices for me personally. But if that is so, I have made them deliberately and proudly, and with great confidence that dentistry, as a separately organized profession, will continue to grow toward its greatest possible value as an important natural division of health service. With great respect for those who conduct the actual work of practice in health service, with due recognition of the earnestness of all concerned, and aware that deficiencies are inevitable in even the ablest and most faithful persons in every walk of life, I believe it may be said with truth that today the average dentist does not make any more mistakes in judgment or in skill than the average physician. No profession in the health-service field has given so much attention as dentistry to the prevention of disease in the individual patient. At no time in the history of this country has dentistry stood deservedly higher in the confidence and esteem of the public than it does today. No other profession is now making a more earnest effort to meet all of its professional responsibilities—to overcome obvious infirmities, which are common to all professions. When I hear any one gloat over the infirmities of dentistry—which are numerous—without also accrediting its achievements and its worthiness, I respond in this way. And I have come from the field of the medical sciences and of scientific medicine to take this position.

I believe, with Dr. Noyes, that discussion should be balanced and fair. Dr. Owre commended one past condition, a relationship of his own. Referring to Dr. Casto's failure to mention the Dental Faculties Association of American Universities (1908 to 1923), Dr. Owre said (p. 387): "This was the body which, from its beginning, was primarily responsible for such progress as had been made toward raising dentistry to the level of a profession." But Dr. Owre himself omitted to mention the National Association of Dental Faculties (1884–23), the American Institute of Dental Teachers (1893–23), and the Dental Educational Council (1909–. . . .), all of which between 1908 and 1923 bore effective parts in achieving that progress and in advancing dental education—two of them having served these causes for years before the others were established, and one of them continuing in this important work since 1923. In several respects each was more useful than the others. Dr. Owre's official relation to the Dental Faculties Asso-

ciation of American Universities seems to have exaggerated his impression of its relative importance, and has also induced forgetfulness of some of the facts that should not be ignored. In 1923, when the American Association of Dental Schools was formed by the amalgamation of the Canadian Dental Faculties Association, and the three national associations named below, 27 of the 46 dental schools in the United States were members of the National Association of Dental Faculties, 13 were members of the Dental Faculties Association of American Universities, 6 were members of neither, and *practically all (including the Canadian) were members of the American Institute of Dental Teachers*. The influence of the Dental Faculties Association of American Universities had slowly been growing stronger as its membership increased from 6 schools in 1908 to 13 in 1923, and would have been much greater if some of its spokesmen (one of them often called a "*chronic* misanthrope") had not been pharisaical in their protestations of superiority. On this aspect of the situation the Carnegie Foundation's *Bulletin on Dental Education* presented the following comment (p. 105): ". . . . Some of the schools in the [Dental Faculties] Association [of American Universities] were poorly supported, generally neglected, or conducted in a mercenary manner by the universities of which they were members. . . . ." In these respects these schools were like proprietary schools, although the latter were frankly not hypocritically commercial. Attempts to glorify the memory of this Association *at the expense* of equally important bodies remind us of the fact that a chief promoter and officer was a representative of a leading dental supply-house, and also recall striking deficiencies that happily have been overcome in the main during the past eight years, but which destroyed all reasons for complacency in that Association before 1923 or for its sanctification since. Regarding some of the schools in this Association the *Bulletin on Dental Education* included the following data, all amply confirmed before publication. (Names are omitted here, the many important improvements in each school since these records were published requiring this form of fair presentation, which is intended only to deflate Dr. Owre's exaggeration.)

1. ". . . . The School was receiving so little attention from the University and so little coöperation from the Medical School that defenders of the proprietary dental school used it effectively not only as evidence of the fact that a university relationship does not necessarily impart educational excellence to a school, but also as support for the contention that an inferior university school may be less useful than a well-managed independent college. The contrast between the generous endowment of the Medical School, one of the best in the United States, and the lack of endowment of the Dental School illustrated the great inequality that then prevailed, and which persists, in most of the universities having medical and dental schools. . . . . Of the three whole-time teachers [1924–25], one, the

Secretary of the School, who also performed administrative duties in assistance to a part-time Dean, was Professor of Materia Medica, Metallurgy, Dental Pathology, Therapeutics, and Roentgenology. Four years ago [1920–21] he taught chemistry, materia medica, metallurgy, pathology, and therapeutics." (This School is now housed in a fine new building in the university's health center, and the overworked professor who occupied a sofa of professorships now sits comfortably and with dignity in a chair. On page 395, in a derogatory reference to "science training" in dental schools, Dr. Owre said: "Sometimes one man will teach four or more fundamental sciences." He did not mention the fact that his illustration applied to earlier conditions in this School in the Dental Faculties Association of American Universities.)

2. "Although representatives of the School coöperated in the organization and maintenance of the Dental Faculties Association of American Universities, the School declined to join the other members of that Association in 1921 when they began to enforce this requirement in preliminary education. The reason for the School's disagreement with the policies of the other state universities, and of all of its former associates in the Dental Faculties Association of American Universities, is suggested by this statement in the pamphlet setting forth the School's 'plan for dental education': 'It is quite generally conceded in the dental profession that the largest part of dental service rendered today is reparative and is rather simple in character demanding only a general knowledge of medical science and a high degree of technical skill. . . . If 80 per cent of dental practice consists of repairing [teeth] or replacing lost teeth or parts thereof, of simple extraction and mouth hygiene, why train persons longer than is required to teach them to render such service?' If the same principle were applied to surgical service, the University of . . . . . would not require of prospective rhinologists, otologists, ophthalmologists and similar practitioners, three years of work in an academic college for admission to the Medical School. It is conceded by physicians that the diagnosis of most cases of sickness is 'easy' and their treatment 'simple'—'Nature effecting the cure.' " At a regional conference of the dental schools in a large section of the United States, of which this School was one, the following "view" was formally adopted by the Conference: "The four-year professional program [curriculum], *based directly on graduation from a high school*, is satisfactory." (This School now requires at least one additional year of work in an academic college for admission.)

3. 'The School has been obliged to pay from current income a heavy annual charge for interest [$51,245 in 1920–24] on an old debt [$200,000] . . . . . and is also expected ultimately to earn a surplus with which to liquidate an 'unpaid balance on equipment' [$29,025]. These financial obstacles have materially retarded the School's development and are impairing its efficiency. To help the School in this emergency, the tuition fee, which was $225 in 1920–21 and $250 during 1921–25, has been raised to $300, and fees for infirmary service have been increased. . . . . This Dental School is associated with one of the leading medical schools and, if given commensurate financial support, could be made a leading factor for the promotion of dental education in close accord with medical education, particularly in the most advanced aspects of each. The University has recently received millions for the improvement of its Medical School. A million more for the removal of the debt on the Dental School, and for the promotion of all aspects of education in oral health-service, could be expended to the very great advantage of . . . . . [city] and . . . . . [state]." (This School is now closely correlated with the Medical School, has been wholly freed from debt, and receives effective special financial support from the University.)

4. "Required clinical instruction elsewhere [University Hospital] than in the College

Infirmary was discontinued in July 1923. . . . . There is a lack of intimacy with the Medical School in the instruction in the correlations between clinical dentistry and clinical medicine. . . . . The twelve teachers of these [elective] dental courses [in the University Hospital for medical or dental students], all of whom practise dentistry, are members of the Medical Faculty, but with several exceptions are not members of the Dental Faculty." Expended for research (1920–24): nothing. (A new dean rejuvenated the School and restored cordial relations with the Medical Faculty. The School will soon occupy a new building in the University's health center, and is active in research. For the first time in the history of this University, the Dental School, under the new leadership, has received a requested grant from the research funds of the Graduate School to promote a study of dental caries, which is now in progress.)

5. "For some years this School was conducted at a profit that was used in large part to support the Medical School. At present [1926] the Dental School carries a heavy debt on which an annual interest charge is paid from [its] current income." (The School is no longer called upon to contribute to the support of the Medical School. Heavy deficits are being paid from general funds.)

6. This School was admitted to the Dental Faculties Association of American Universities in 1922—a year before the organization of the American Association of Dental Schools. The published minutes of the former (Dr. Owre in the chair) refer to the admission of the School as follows: "The letters showed to the satisfaction of the members that the president of . . . . University had now directed a separate budget for the Dental School and had discontinued it as part of the . . . . service of the University." Teachers of medical subjects did not give dental students instruction in clinical medicine; teachers of dental subjects did not give medical students instruction in clinical dentistry. In July 1923, this School was united with an independent School, which, under a new name, became a larger professional unit in the University, although situated more than two miles from the Medical School and five miles from the main site of the University. (Now the School is in a new health center, closely associated with the Medical School and Hospital, and receiving exceptional financial support from the University.)

7. In 1923 this Dental School and the Medical School occupied an inadequate building far from the University campus, and the Dental School fell in grade from Class A to Class B. Expenditure for research, 1920–24: nothing. (At present these schools, removed to the University campus, occupy a fine new building, which has been paid from a legislative grant. The Dental School is now rated Class A and is active in research.)

8. "There is a striking contrast between the excellent facilities for instruction in the academic and medico-dental subjects on the University campus and the poorly adapted quarters for clinical dentistry in a rented [theatre] building" [erected in 1891]. Dean: former owner, who received for the property a total of $17,867, in annual instalments with interest at 6 per cent from current income. Expenditure for research, 1920–24: nothing; for improvement of the dental section of the University library, 1920–24, $14.00 (fourteen dollars). (Now this School occupies a new building on the University campus and is receiving effective support.)

9. "The fate of the graduates of this School, in the state-board examinations, during the past sixteen years (1910–25), presents a striking anomaly, an average of 19.3 per cent of the number having failed to pass at the first attempt. Only one other university school now rated Class A has a record of more failures during this period." Received from the University, in funds for current income: nothing. Paid to the university, from current income (including income from endowment) for all phases of coöperation—in 1920–24—

an *average* of $51,110 per year. Expended for research, annually, 1920–24 (average): $1,712. (The results of the subsequent license examinations have been more favorable to the School.)

10. Before the American Association of Dental Schools had been organized in January, 1923, this School was paying interest on a debt of a quarter of a million dollars. On June 30, 1923, "the cancellation of an accumulated debt of $261,000, and also of a charge for interest amounting to $13,000 for 1922–23, was an impressive indication of the ability of the University to give the School liberal support," when it was inclined to do so. The Medical School had been receiving exceptional support for years. (Now, this Dental School having an increasing endowment is receiving unusual support from the University.)

A further illustration of the ease with which misrepresentation may be circulated was Dr. Owre's remark that "dental education, which had made relatively rapid improvement up to the initiation of the Carnegie Survey [begun in 1921], and was then making more rapid gains than ever before, has not, in general, maintained its upward trend" (p. 400). This assertion is not a contribution to the history of dental education. The comment above indicates a few of the many improvements since 1923 in schools that were formerly members of the Dental Faculties Association of American Universities. Ignore all of these improvements, and disregard such outstanding recent developments as the new building for the Medical and Dental Schools at Northwestern University, and Mrs. Montgomery Ward's gifts of more than $5,000,000 for these and other purposes in the two schools, including endowments for scholarships and research. Test the quality of Dr. Owre's judgment by recalling the changes that have occurred since 1921 in this city alone, and which are well known to all present. In 1921 there were three dental schools in New York—two independent; one in a university where it was not receiving notable support or encouragement. You will easily recall the reputation of each of the three in 1921. Now there are only two dental schools—each an integral part of a university. Have there not been extraordinary improvements in dental education in this city since 1921 from almost every point of view? I need only ask this question to start a long procession of such improvements through your recollections. Similar evolution in dental education has occurred in all parts of the country, and the steady trend of improvement must be evident to all who are informed, and also fair in their judgments, however anxious we may be to see the evolution proceed more rapidly. In my discussion of Dr. Casto's paper I shall refer again to some of the obvious improvements. But in this connection it will be appropriate to call immediate attention to a few additional data. Dr. Owre, in his derogatory remarks, has not mentioned the important fact that of the university dental schools in the United States, each, excepting that of Loyola in New Orleans, is contained *in a university*

having a medical school. If the dental school in any university is not now receiving proper attention, while the associated medical school is well supported, is the fault with the dental school or with the university that might more effectively meet its public obligations in professional education? Dr. Owre's condemnation has been misplaced. He lauds universities in general, but, knowing that some of their dental schools are neglected, he unjustly blames the dental schools and disparages dentistry. We all know that lack of funds in many universities, not only in New York but elsewhere, has seriously interfered with the growth of dental schools. We all believe that as soon as adequate endowment funds can be raised, various disabilities will disappear. Let us see these facts in their true light—not always as evidences of unworthy purpose or of intentional neglect, but rather chiefly of lack of funds. In his comparisons, Dr. Owre has not reminded you that in this country there are now five "recognized" independent *medical* schools and six unacceptable proprietary *medical* schools, but only five independent *dental* schools and no proprietary *dental* schools. Judgments to be effective should be balanced, not one sided. Some fair statements about the five independent dental schools are in order.

The *North Pacific College of Oregon*, in Portland, has been a combination of schools of dentistry and pharmacy, chiefly dental. Although rechartered as a philanthropic institution (1924), it has been unsuccessful in its efforts to unite with the University of Oregon, which has a medical school but not a dental school.

The *College of Physicians and Surgeons*, in San Francisco, formerly a combination of schools of medicine, dentistry, and pharmacy, is now a dental school only. It has been rechartered as a philanthropic institution (1923). The principal amount of the "Alumni Foundation Fund," for special purposes relating to advanced work, has risen to $18,064. Leland Stanford has formally indicated willingness to accept this school into organic union, if sufficient endowment can be added, which the friends of the school are trying to raise.

When Lincoln and Lee University was established in Kansas City, Mo., a few years ago by the Methodist Episcopal Church South, with Bishop Waldorf as its head, the *Kansas City-Western Dental College* (rechartered in 1923 as a philanthropic institution) was incorporated into it, in a fair and sincere arrangement, before the University had established any other unit. Unfortunately the financial plans of the Methodist Episcopal Church South for the development of Lincoln and Lee University have not matured, for reasons that are not a discredit to any one concerned. One of the remarks in what Dr. Owre read was a superficial allusion to this particular situation. The late Dr. Howard S. Lowry of Kansas City recently left a fund of $67,000, the income of which is to be devoted to the promotion of dentistry for children in the Kansas City-Western Dental College. Citizens of Kansas City have lately obtained a charter for a University of Kansas City. It has been suggested informally that it will include the Dental School.

The *Texas Dental College*, in Houston, recently rebuilt, has been rechartered as a philanthropic institution (1929) and offered to the State of Texas. Committees of the state

legislature, the state university, and the state dental society, have its final disposition under advisement. A bill providing for the acceptance of the School by the state has been introduced in the legislature. In the event the bill becomes law, the affairs of the School would be under the direction of a board of six regents appointed by the Governor.

The *Atlanta-Southern Dental College*, recently rebuilt, has been rechartered as a philanthropic institution (1926). It has endeavored, thus far unsuccessfully, to bring the School into organic union with one of three universities in the State of Georgia.

In each of these five schools—all rechartered since 1923—property is being conserved, debts are being paid from current income, in the manner, for example, of some schools in the former Dental Faculties Association of American Universities—and the instruction is being conducted under seriously limited resources. The conversion of each of these schools into a university school at the earliest possible date, or its discontinuance, is devoutly to be wished. But meanwhile fair treatment of all concerned will not be out of place. It should not be forgotten that these dental schools, so far as organization and relationships are concerned, are similar to the five "recognized" independent *medical* schools; namely, Hahnemann Medical College and Hospital (Philadelphia), Jefferson Medical College (Philadelphia), Long Island College Hospital (New York City), New York Homeopathic Medical College and Flower Hospital (New York City), and Woman's Medical College of Pennsylvania (Philadelphia), each of which is situated near an important university, but all remain independent. Dr. Owre's comparisons between dentistry and medicine are obviously unreal. To extol everything medical and to condemn everything dental deceives nobody—and certainly cannot appeal to physicians "in the gallery." When the best in medicine and the best in dentistry are compared, and when the worst in medicine and the worst in dentistry are contrasted, both physicians and dentists derive important suggestions for earnest and profitable reflection, and for more intimate coöperation. The lay public may well hope that such reflections will continue to improve the health service of each group, there being plenty of opportunity for betterment in each division.

Dr. Owre said he approved the assertion that an unnamed somebody said to Dr. Noyes that "a dental educator. . . . . filled in his income tax report last year a net profit of over $100,000 derived from a proprietary educational institution in dentistry" (p. 397). Dr. Owre would naturally not present this assertion as his own unless he knew it was true, and of course he knows the name of the man who made this profit. All of the five independent dental schools have been rechartered as philanthropic institutions and, being non-proprietary, no one can legally derive private profit from the management of any of them. If any officer made $100,000 for himself

"last year" in the conduct of any dental school in the United States, he has done so illegally and under false pretenses. I ask Dr. Owre to give us, before he leaves the meeting, the name of this crook so that he and the illegal conditions in the school may be effectively exposed. An anonymous statement having an import so serious as this charge should not be accepted until adequate evidence is presented. Why should not Dr. Owre bravely reveal the facts? Personally I do not believe that the "unnamed somebody" told the truth to Dr. Noyes. Why that "unnamed somebody" did not make the profit $1,000,000 instead merely of $100,000 I cannot imagine. [Dr. Owre did not respond to the request to give the name of the "crook" who is reputed to have taken a profit of $100,000 "last year" from a dental school in the United States. If any responsible person can show that this has been done, this *Journal* will publicly pay to that person $1,000 for the proof, and will promptly publish the certified facts.—*Ed.*]

In alluding to the Dental Faculties Association of American Universities, over which tonight and repeatedly in recent years Dr. Owre has sought to suspend a halo, he said (p. 387): "It disbanded, though not without many misgivings, to merge in the American Association of Dental Schools, during the Carnegie Survey, in a disinterested effort to further the cause of dental education. This now appears to have been brought about as a political move by those concerned with preserving the *status quo* at any cost." This statement is so completely unworthy of any honorable intent, that I am forced to expose its gross untruthfulness. Early in October, 1922, after a long and careful study of the reasons for the recurrent and demoralizing disagreements among several antagonistic groups concerned in the promotion of dental education, and believing the time had come for united primary attention to real issues unaffected by personalities, I suggested, entirely on my own personal initiative and responsibility, in an open letter to the deans of all the dental schools and to representatives of the four then existing *national* organizations of dental teachers and dental schools in Canada and the United States, that an *international* "American Association of Dental Schools" be organized by *amalgamation* of these four bodies. This proposal was freely and actively discussed in all of the schools until late in January 1923, when officially designated representatives of the four bodies concerned, after preliminary ratifications, met in Omaha, Nebraska, during the progress there of an annual meeting of the American Institute of Dental Teachers, and by unanimous agreement organized the proposed Association. The bodies that were thus voluntarily amalgamated into the new Association, each represented by five delegates in attendance, were the American Institute of Dental Teachers, the Canadian Dental Faculties Association,

the National Association of Dental Faculties, and the Dental Faculties Association of American Universities. The names of the official representatives of the latter body, repeatedly published, were these: "Alfred Owre, Marcus L. Ward, Charles R. Turner, Frederick C. Waite, Augustus S. Downing." The action of these five delegates was formally ratified by their Association. Does anyone anywhere, including Dr. Owre, believe that these five men who had wide experience in dental education were duped by anybody, and that they could not have detected the unworthy purpose that Dr. Owre now insinuates, if any such plan had been afoot? By the unanimous vote of the delegates I served as chairman throughout the conference at which the amalgamation occurred. When the preparation of a constitution was begun, remembering what the real difficulties in the way of previous accord had been, I personally proposed four provisions that were intended, as I stated frankly, to surmount the old obstacles and *to make the Constitution completely satisfactory to the two smallest organizations concerned*; namely, the *Canadian Dental Faculties Association* and the *Dental Faculties Association of American Universities*. One of these provisions was a statement of objects that would include all the *real* purposes then commonly avowed—and only the *real* purposes. The second was an article that would automatically prevent executive intrusion by the teachers in one country into the affairs that chiefly concerned those in the other. The third was a restriction that would make it impossible for any majority to force any kind of a mandate upon any minority—thus eliminating all occasion for disputes on anything fundamental, making the Association an organization for *discussion and persuasion only, and preventing it from becoming in any sense a mechanism for directing or controlling* any school or group of schools. The fourth made amendments to the Constitution so extremely difficult that only matters receiving practically unanimous consent could be voted into it. These four provisions follow (reprinted annually in the *Proceedings of the American Association of Dental Schools*; latter part of each volume):

"*Article I. Origin, name and objects.* . . . Section 2. *Objects.* The American Association of Dental Schools has been established to facilitate intercourse and conference among *teachers* of the dental sciences and arts in North America; to promote advancement of *teaching* and research in American schools of dentistry; to encourage thorough study and discussion of the needs and problems of dental education; to improve public understanding and appreciation of the quality and value of dentistry; and to maintain dental education in full accord with the highest requirements of professional education in the public service.

"*Article III. International relationships.* Matters affecting particularly or exclusively the schools of one nation may be freely discussed in the sessions of this Association, but only the schools of the nation directly concerned may vote on matters of this special character.

"*Article VIII. Restriction of mandatory action.* No vote taken by this Association can have mandatory effect, on matters or procedures that are not specifically stated in this Constitution, unless (a) the resolution on which the vote is recorded shall have been presented in writing, and (b) the said vote taken at a session on a succeeding day at a specified hour as a special order, and (c) passed by the *unanimous* approval of the voting delegates present in the session at which the action is taken; but these restrictions may not be made a means for amendment of this Constitution, the method for which having been specified in Section I of Article IX [below].

"*Article IX. Amendments.* Section 1. *Constitution.* Any proposed amendment to this Constitution must be presented in writing at a session of an annual meeting. It shall be laid on the table until the next annual meeting; and every active member shall be notified promptly, by the Secretary-treasurer, of such proposed amendment. It may be adopted only by an affirmative vote of *three-fourths* of the active members [schools] of the Association; but this provision does not apply to Article VIII [above], which is not amendable under any circumstances whatsoever."

These four provisions, which I myself prepared and which were *avowedly intended to protect the then existing and conscious minorities* and also all new minorities, *were adopted unanimously*, Dr. Owre present and voting. These facts are so well-known that I regret the necessity to repeat them. But they present several relevant questions. If, as Dr. Owre insinuates, the establishment of this organization was "a political move by those concerned with preserving the *status quo* at any cost," one wonders how the organizers could have expected this Association to "preserve" *anything* except its own constitution, since it was given no powers over its members *except such as would be yielded by their unanimous consent.* He pretends its establishment was "a political move by those *concerned.*" But he, as a free, responsible and self-respecting delegate, was as much *concerned* as anyone. The Association is so constituted that, outside of the field of its purely routine affairs, a majority can *dictate* nothing, but a minority, always able to prevent executive action, can use its powers of reason and persuasion to induce voluntary change of opinion and policy in the schools. What now prevents a member from presenting a *cause* in a persuasive and convincing way at any meeting of the American Association of Dental Schools? To this question the answer is that there is nothing to prevent it except personal inability to be either persuasive or convincing. The members of the Dental Faculties Association of American Universities, by transferring their activities to such an association of all the dental schools and teachers, lost no opportunity to influence dental education constructively. By so doing, they entered a larger group where their activities might be more broadly convincing and influential and where their individual freedom cannot be impaired? Dr. Owre, in accordance with parliamentary usage, is free to take the floor at every meeting of the Association, and to propose anything. But if, in his

experience, his stated views have not received approval, and *younger members have obviously had more influence*, should the Association be condemned because in the exercise of discretion its members have not accepted his views. If his opinions were valid, why were they not endorsed? If they were not sound, why should they have been approved?

Following the statement about the Association as a "political move," Dr. Owre said (p. 387): "Representations that the university point of view, now of course held by a minority, would be respected have not been lived up to." This is another perversion of the truth. Of the 43 schools in the Association, 35 are integral parts of universities, 1 is affiilated with a university, 2 are parts of "recognized" groups of health service schools, and 5 are independent but seeking to become organic parts of universities. There is an overwhelming majority of university schools. What is the "university point of view" that Dr. Owre claims is not being respected? Which university's view? Does he mean, for instance, the "view" of that university which, although a member of the Association of American Universities, a few years ago permitted its dental school to admit to advanced standing students from a proprietary school—and did so to reduce the deficit in the conduct of the dental school? Does the "university point of view" mean the maintenance of such undesirable conditions as those indicated in paragraphs 1 to 10 on pages 406–9, which existed in schools holding membership in 1923 in the Dental Faculties Association of American Universities? Which university school fails now to "respect" the "university view," whatever that may be? What is meant by "respect?" If some university dental schools are not fully in accord with whatever he means by "university view," is lack of financial resources the chief reason, or do these schools perversely prevent their universities from dealing justly with the public? If the latter, where do these schools derive this great power to control their universities? And as for the alleged "representations" that "have not been lived up to:" Did Dr. Owre ever bring them to the attention of the Association? Has the Association voted yes or no on any of them? Having been given no executive power, could it ever require anything about them except by unanimous vote? But what were these alleged "representations?" Who made "representations" to or for any of the delegates individually, to or for any of the organizations concerned? I recall that I personally openly and freely expressed *faith* and *belief* that all of the objects stated in the Constitution would receive the cordial support of every school. I also had the same faith and belief that all of the universities having dental schools would awaken to their responsibilities, and actively promote the advancement of dental education to its highest attain-

able level. I recall that these views were shared by all of the delegates at the conference of organization, but they were avowedly only individual expressions of faith and belief, and not in any sense anything more. Certainly no "representations"—surely none that would have involved *private* accommodations—could have been made for or accepted by the five gentlemen named on page 413 as official delegates from the Dental Faculties Association of American Universities.

If the American Association of Dental Schools "has done very little to forward dental education but a great deal of 'stalling' " (p. 387), what has become of the influence of the schools that, in Dr. Owre's judgment, were formerly so progressive, and why has it disappeared? The following facts bearing on the relationship of representatives of the bodies that had been amalgamated show that the influence of the former members of the Dental Faculties Association of American Universities was decidedly in evidence at the meeting of the American Association of Dental Schools, in Toronto in 1930, to which he referred:

Associations before amalgamation in 1923	Number of member-schools before amalgamation in 1923	Number of designated speakers on the official program	Number of officers and members of Executive Committee
Dental Faculties Association of American Universities.....	13	31	3
National Association of Dental Faculties.....	27	17	3
Canadian Association of Dental Faculties.....	5	4	1
(Persons not members of the bodies named above).....	(..)	(9)	(..)

Dr. Owre asserts that the Dental Faculties Association of American Universities "in 1919 (with the coöperation of the State Department of Education in New York) required two predental years to begin in 1926." Again historic facts have been misstated. The published minutes of the Association, in 1919, do not mention this action, but during the Carnegie Foundation's study of dental education I received a formal statement indicating that an officer of the Department of Education *forced* the Association into an advanced position. The *Proceedings* of the Association show such significant details as the following, ten days after the beginning of the study of dental education:

"At the afternoon session the discussion again reverted to the five-year curriculum [1–4 plan]. After much discussion as to whether or not the New York requirement could

be enforced, the chair appointed a committee . . . . to draw up a telegram and send to Dr. Downing. The purport of the telegram was to inquire whether or not a man could be admitted conditioned in one of the two sciences provided he had sufficient credit in other subjects to make up the required hours. Dr. . . . . announced that . . . . had decided not to establish the predental year until after the Carnegie survey of dental education" [p. 102; January 23, 1921].

It was "reported [by. . . .] that the telegram he was authorized to send to Dr. Downing had been sent, and the report had been sent to the secretary of the Association. The telegram in reply read as follows: 'January 24, 1931—Can't agree suggested modification predental year. Present requirement not too severe. Prospective students easily get English, biology, chemistry, and even physics if they have not had the last subject in high school. Six semester hours proposed electives satisfactory. *Please do nothing to longer make impossible registration university schools.* Kindest regards everybody—Augustus S. Downing.' There was a unanimous vote to have . . . . take up the matter presented by telegram with Dr. Downing and *further urge its adoption*" [p. 104; January 24, 1921; italic not in the original].

Conditions at Columbia have been mentioned. Dr. Owre says he does not speak of them "out of vainglory." He has overlooked the fact that when the Dental School at Columbia was opened in 1916, the School required two years of approved work in an accredited academic college for admission; the first two years of the curriculum were devoted to the medical sciences in the laboratories of the Medical School; and it was aimed to effect, in the concluding years of the curriculum, close correlation between clinical dentistry and clinical medicine. The Faculty did not further these plans at the suggestion of the Dental Faculties Association of American Universities, graduation from a high school having then been sufficient for admission to the schools represented in that Association. The present greatly improved conditions in the new environment, and the close coördination with the Medical School and Hospital, were also projected, in the main, by the founders of the School including Dr. Van Woert, long before 1927.

Dr. Owre bases much of his discussion on views expressed by Dr. Abraham Flexner, who recently, in considering various conditions at Columbia, commented without due regard for some pertinent facts. Dr. Flexner would exclude dentistry from universities, but would include proctology. This contrast shows the profundity of some of the distinctions that evidently appeal to Dr. Owre, who, accepting Dr. Flexner's definition of "profession," concludes that dentistry is not a profession, but that the master-servant plan would make it one. There is much froth in his references to the meaning of "profession." Usage, not occasional opinion however entertaining, determines the meaning of words. Here is an accepted definition of "profession" (*Century Dictionary and Cyclopedia*):

Profession: . . . . 3. . . . . specifically, a vocation in which a professed knowledge of some department of science or learning is used by its practical application to

affairs of others, either in advising, guiding, or teaching them, or in serving their interests or welfare in the practice of an art founded on it. Formerly theology, law, and medicine were specifically known as *the professions*; but, as the applications of science and learning are extended to other departments of affairs, other vocations also receive the name. . . . 4. The collective body of persons engaged in a calling. . . ."

Dentistry is plainly a profession in the full sense of the word. Recently President Butler of Columbia University, referring to business as a profession, spoke of Columbia's School of Business as an agency to make business a "learned profession," the School being on the same plane and on the same status of control and opportunity as the older schools in the University. President Butler uses "profession" in its accepted sense. On Dr. Owre's master-servant plan, the great volume of actual dental practice would be done by unlearned assistants having the minimum public school education required by law for all children. The masters on this plan would be physicians and thus members of the medical profession. If Dr. Owre's restrictive definition of "profession" is valid, would anything then be left of the dental profession? Dental practice would be continued, but the dental profession would obviously become extinct.

Every man is a debtor to his profession. However ardent may be his zeal for his profession's improvement, and however earnestly he feels he must oppose its tendencies, his obligations to it include fairness in criticism —decency and sportsmanship should make anything less than that impossible. "Vested interests" explain, for Dr. Owre, the reason for the general disapproval of his destructive purposes. That others are quite as disinterested does not seem to be apparent. The dignified criticism a year ago at Toronto, as applied to his conduct, by the Canadian president of the American Association of Dental Schools, is called a "diatribe." The American Association of Dental Schools, disagreeing with Dr. Owre on the proposed destruction of the dental profession, is said to be "violently in favor of an autonomous dentistry," yet no trace of violence has ever been indicated in the Association's actions. There were allusions and implications about leadership. Ibsen was quoted in support of the idea—consoling for a type of would-be leadership— that "the majority is always wrong," which of course is a way of asserting that *the minority is always right.* James has written that "a leader is not a bully nor a swanker who struts about giving orders, but rather is he one who represents and serves those who follow him." A Napoleonic complex feeds on delusions of grandeur, and many a "leader," viewing his support in a mirror, has derived unwarranted encouragement from such alluring visions. "Divide and destroy" was a Napoleonic purpose. Has it become a motive in a visionary campaign in dentistry?

We have been told that the organized practitioners of dentistry cannot be expected to do anything about dental education. What is the purpose of this meeting and discussion—to learn "where you get off?" According to Dr. Owre (p. 385), the "evolution [of dental education] is naturally bound up with that of medical education. . . . . Dental education like any other must be worked out by men in the field—that is, by dental and medical educators *acting for the universities. It is not a matter for the mass of men practising dentistry*" [italic not in the original]. Perhaps dental statutes, state boards of dental examiners, state departments of education, etc., are all "acting for the universities." On this subject Dr. Fishbein, editor of the *Journal of the American Medical Association*, has recently written as follows (*Diplomate*, 1931, iii, p. 2):

> . . . . "The medical profession of this country will always be greatly concerned . . . . with the type of physician that is to be added to its numbers. *Who better than the medical profession can know the advantages and deficiencies of medical education?* . . . . The members of the American Medical Association are greatly concerned with the type of medical practice that is to be established in the United States in the future. . . . . The Council on Medical Education and Hospitals is concerned as much today as it ever has been *with the curriculum of the medical college*, with the hospital in which the young man gets an internship, and with the nature of his practice after he graduates" [italic not in the original].

In alluding to the "science-training" in dental schools, and to the predental requirements in particular, Dr. Owre included these remarks (p. 396): "Even the two-three plan is flagrantly violated in some schools. In one, the 60 academic points required by the plan are reduced to 40; 'dentistry' is substituted for the rest." Omitting reference for a moment to the "one" school, I can say for the others in the group that the 60-point predental requirement is being faithfully observed. As for the "one" school that, according to Dr. Owre, exacts only 40 of the "60 academic points required by the plan," the facts are these: The admission requirement is 65 credits, of which 53 are conventional academic subjects, and 12 others test directly the dental aptitude of the academic student. Prospective dental students *who wish to obtain the B.S. degree*, besides the D.D.S. degree, are obliged to take 4 additional academic credits in order to meet the full academic requirements for that degree as established by the University, and must also earn 42 quality points in the academic subjects. Summer courses are made available to students during the predental period in order that, by extra work, they may meet all requirements, *including the aptitude tests*, within the field of their election. *The University regards these arrangements as experimental during a transitional period.* Such experimental procedures

are desirable, and are becoming common, in the professional schools. The assertion that only 40 academic credits are required for admission to this school, and the obvious implication that the University is violating its stated academic standard for admission to the study of dentistry, are thus seen to be not only unwarranted but palpably misleading.

You have heard that a number of grants have been made to advance dentistry "through medicine." Dr. Owre seems to mean *through medical sciences* rather than *through medicine*. The statement that "a fundamental medical training is necessary" for the practice of dentistry is commonly intended to convey the idea that the preparation for dental practice should be based on the so-called medical sciences, but many are misled by this statement. Various separately organized divisions of science, such as anatomy, bacteriology, biochemistry, embryology, histology, etc., are often conveniently though narrowly called "medical" sciences, because they are important factors in medical practice, but in medical education they are more appropriately termed "fundamental," "basic," or "pre-clinical" sciences. Most of the teachers of the "medical" sciences in medical schools have been specially trained for their duties in these sciences, and do not have the M. D. degree. The "medical" sciences do not collectively constitute the *science of medicine*, but they contribute thereto. Individually the "medical" sciences "belong" unreservedly wherever they may be applied. When they are used for the promotion of agriculture, for example, they become a part of agriculture, *they do not convert agriculture into medical practice*. The use of "medical" sciences for the development of dentistry makes dental practice more scientific and more efficient, but that use does not change dental practice into medical practice.

Discussion of Dr. Casto's paper[19]

We are passing through an era of unusual unrest. Every field of human interest, every profession, seems to be undergoing a clinical, if not a critical, examination. Desired betterment of the conditions of life for the average man, woman, and child, is the great motivating force in this period of changing conditions and altering points of view. But this force has been the main-spring in the movement of civilization through the centuries. The social evolution of the human race is evidently proceeding faster than usual. Perhaps it will soon slow up for awhile. Many of our customs and views are a poor fit because we are outgrowing them. Fortunately, common sense and sanity, and courage and sincerity, have lost none of their guiding and protective influences in any community.

[19] See the opening paragraph of this discussion, on p. 403.

Probably no aspect of human affairs is undergoing a more severe and searching examination than what we conveniently call education. Every phase of it has been "put on the spot." Under the light of this sharp publicity, every kind of school from the kindergarten to the university is being undressed and examined in all postures—and inside and out—by experts and by quacks, and written about copiously by wise men and by fools. Perhaps a clear diagnosis will thus be achieved. Possibly with suitable treatment, the patient, i.e., the system of education, will be better after the treatment than before. Perhaps then it will provide an ideal education, whatever that may be. In this continuing educational clinic, it is even supposed that the students are not seriously injuring themselves in their efforts and might be persuaded to do better. Now and then someone rudely intimates that the teachers—especially the older college professors—have a lot to learn and ought to be at it. There is an oft repeated conviction that when a man can't *do* anything worthwhile, it is suitable for him to become a teacher. Also, that when a teacher can neither *do* anything nor *teach* anything, he becomes a promising candidate for the office of dean.

Education is a perplexing problem because it is an intangible process and not a visible product. When a teacher thinks he is giving it, nobody present may be getting it. It is essentially what a student derives within himself and for himself, under guidance that helps him to see and to feel and to understand, and thus to acquire increased mental power for transmission into his own real intellectual tasks. A brilliant teacher may accomplish practically nothing with an indifferent student. A brilliant student may acquire a fine education despite the attentions of poor teachers. These well-known facts should help us to keep our perspective and to refrain from magnifying the importance of externals in education. We are apt to forget all about the internals—the essentials—which are the minds and hearts and aspirations and personalities of the students.

In all of this searching of education, dental education has had its full share. The Carnegie Foundation's study of dental education, begun ten years ago, stimulated a prolonged awakening, favored an earnest self-examination, promoted progress, and concentrated attention on essentials. Dr. Casto appears to deplore the lack of uniformity in the ensuing plans for the trip to the destination in dental education. I feel that this lack of uniformity has accelerated progress rather than retarded it. I see in this variety of plans not a deplorable situation, but rather a desirable one, for from it will emerge, by experimentation, not a routine continuance of what might not have been useful, but the selection of a route or routes, which, representing the most instructive experience, will be the best for all con-

cerned. If for purposes of illustration we were to compare our terminal in dental education with Chicago, and the 1–4 plan with the New York Central, the 2–3 plan with the Pennsylvania, and the 2–4 plan with the Baltimore and Ohio, our different preferences as to the route to be taken to Chicago from New York would hardly disturb us. These differences in preference would seem entirely natural. Differences of opinion as to these routes and their peculiarities would be immaterial compared with our purpose to arrive in Chicago, and our expectations and activities while there. The objective in dental education is fundamental. The route thereto, while important as a means to the end, is wholly a matter of expediency, convenience, and preference. Several routes should be kept open for the exercise of choice. Besides, a new bus route may be better than any rail route. And later we may wish to go by airplane. Let us get this situation clearly envisaged, and avoid emotional waste and personal differences on matters of choice and procedure that fall chiefly among the expedients of administrative and teaching technology. Dr. Casto suggests that none of the various plans that I have called routes can be a "panacea." It is a surprise to hear that any plan has been regarded as such. Each plan is simply a way, to be abandoned when a better path can be laid out. This has been the story of all educational plans, and probably will be "continued in our next" indefinitely in the future.

The American Association of Dental Schools has received from the Carnegie Corporation a grant of $20,000 to enable it to conduct a special study of the details, content, structure and reorganization of the dental curriculum, with a view to ascertaining additional facts on which further improvement in the courses and teaching may be made under the advice of that Association. A committee of five deans and several educational consultants are now engaged in the work. Every dental school in the United States and Canada is now giving special attention to its methods and objectives. The Carnegie Corporation has recently appropriated $70,000 to assist twenty dental schools to improve their libraries. The immediate consequences of the current efforts toward betterment of dental education present an eminently progressive prospect. Infirmities are numerous and deficiencies are very conspicuous, but their removal is the purpose of all in responsible relationships. The dental profession has abundant cause to congratulate itself that *the soul of dentistry goes marching on.* I say this with my mind on the remarkable progress that dental education has made during the past decade, which I have followed closely with keen interest. If we examine that progress in terms only of the varieties of curriculum-plans used by the schools to promote advancement, we find the striking evidences shown in

Table 1, where it may be seen that whereas ten years ago graduation from a four-year high school was sufficient for admission to all but two schools, now all require in addition at least one year of approved work in an accredited academic college and nearly half the number exact two years. General adjustment to the latter admission requirement is now clearly in progress.

I agree with Dr. Casto that dentistry should be maintained as a separately organized profession. Doubt as to this presents the key to current uncer-

TABLE 1

Classification of the United States dental schools according to minimum academic requirement for admission to the first-year class and extent of undergraduate professional curriculum

ACADEMIC YEARS	PLANS[1]						TOTAL NUMBER OF SCHOOLS	NUMBER OF SCHOOLS REQUIRING AT LEAST TWO ACADEMIC COLLEGE YEARS FOR ADMISSION
	0[2]–4	1–4	2–3		2–4	3–4		
			Short years[3]	Long years[3]				
1920–21	44	1	0	0	1	0	46	1
1925–26	15	25	1	0	2	1[4]	44	4
1930–31	0	22[5]	5	1[6]	10[7]	0	38[5]	16[7]

[1] The first numeral in each heading-pair indicates years of required work in an academic college; the second, years in the undergraduate professional curriculum.

[2] Graduation from a four-year high school was sufficient for admission.

[3] "Short years" signifies years of conventional academic length in the dental school; "long years," academic years that include summer "quarters" in the dental school.

[4] School of Medicine and Dentistry, University of Rochester; had no dental students; in dentistry now offers graduate work only.

[5] This total does not include the 1–4 school in the University of Denver, which will be discontinued in June 1931.

[6] At Columbia (2–4) and Northwestern (1–4), the four-year curriculum may, at the option of the student, be completed in three years of twelve consecutive quarters.

[7] The five Canadian schools are proceeding on the total time-equivalent of the 2–4 plan. Of the 43 schools in the United States and Canada, 20 require at least two years of approved work in an accredited academic college for admission.

tainties and difficulties. If you study the literature beginning, say, in 1839 and come forward, you will find it saturated with discussions of this subject. From the beginning the "same old things" have been repeated over and over again, but meanwhile, as I said a few minutes ago, "the soul of dentistry goes marching on." If dentistry is to be made a specialty of statutory medical practice (and by this we all understand a foundation upon the M.D. degree with a license to practise general medicine), the destination, again speaking figuratively, would be in a different part of the country, and a new route

would have to be found.[20] In the discussion of this matter we should keep clearly in mind the fact that combined medical and dental training for the M.D. and D.D.S. degrees has been open to all who are competent voluntarily to obtain it. Very few have obtained the double training. There must be excellent practical reasons for the general failure to do so. The longer and more intensively I study dental problems, the more firmly I find myself convinced that dentistry should and will be maintained as a separately organized profession, but developed into the health-service equivalent of an oral specialty of medical practice, with correlative intimate cooperation between physicians and dentists. Also that this should and can be accomplished without burdening dentistry with the redundancies and irrelevancies, for dental practice, of the full conventional training for the M.D. degree. The *reality* of service equivalence can and will be achieved by men and women trained intensively in all aspects of the practice of dentistry, and devoted to its ideals and to its advancement in the public interest. And this desirable equivalence will be attained at a minimum cost to the prospective practitioners in money, effort, and time. I have based upon broad principles the conviction that dentistry, both as a profession and a practice, can best be promoted in the public interest by a system of organization, education, and public regulation that will insure continuance of its present intensive development, and that will prevent it from falling into the relative neglect that would occur if it were submerged into conventional medicine. Recently several of these principles have been briefly intimated in another relation by President Butler of Columbia University. It gives me great pleasure to quote the following comment from his last Annual Report, issued late in December, 1930:

> "The university study of business organization, business principles and business methods stands in the same relation to the study of economics, sociology and law that the university study of engineering occupies in relation to mathematical and physical science. *It profits by a separate organization and by an independent university consciousness just as does engineering and for like reasons*" (page 41; italic not in the original).

True of business and of engineering, these principles apply equally to dentistry, which, as a separately organized profession in America, will in 1939–40 be one hundred years old—an age that testifies not only to its virility,

[20] This is a reference to conditions as they exist in medical practice. What *might* happen to change these conditions is a subject for interesting speculation. What a few persons are seeking to bring about may not merit general approval. When the authorized representatives of "organized medicine" effect changes that will liberalize the system of medical education, we may expect that the related bridges will be crossed when "organized dentistry" arrives before them.

usefulness, and permanence as a profession, but also to the fidelity of a long and sturdy succession of devoted practitioners. Its attainment of this age implies possession of fundamental qualities. Anything ninety years old is apt to be either very strong or very weak.

Dr. Casto is certainly right in saying that dental practice by "a super-dentist with a bevy of craftsman assistants working under him will not solve the major problem." Such a plan, which is not a different route but a different destination, if put into operation, would not only destroy the dental profession, but also degrade responsible personal health service to a lower level than any that has excited past criticism. Some physicians who had commended the master-servant plan as related to dentistry now see that, if it fits dentistry, it also applies to medicine. If we wished to bring on "state medicine," this plan for the degradation of dentistry would be a long step toward it. If one master mind can direct at least twenty servants in intra-oral dental practice, as is alleged, laymen will naturally ask: why not make the masters as well as the servants the employees of the state? I hope and believe that our colleagues in the Dental Faculty of Columbia University will show to the President, the Trustees, and the Dean the many cogent public and professional reasons why this plan as proposed by the Dean in his last annual report to the President should not be adopted for the University.

Dr. Casto has referred to research in such a way as possibly to be misunderstood. I believe he means to leave the impression that the useful aspects of research should be carefully woven into the affairs of every dental school, but that the members of the dental faculty who conduct research should not be permitted, in the name of research, to neglect their duties as teachers. Some of the poorest teachers I ever knew were among the most distinguished research men. Some of the most inspiring teachers I ever knew never published a paper on research. Again the old solution suggests itself: common sense and moderation applied to realities. Some of Dr. Casto's allusions to graduate work leave me uncertain as to the scope of his view. He appears to oppose graduate work for a D.D.S. degree, based on the prior acquisition of an M.D. degree, as a *requirement* for admission to dental practice. But I believe he does not oppose *voluntary* graduate work by any physician who might desire to obtain the D.D.S. degree and then to specialize in dentistry. Dr. Casto refers with disfavor to the hypothetical establishment of "graduate schools in connection with every dental school" to make "a specialist of every dentist." I have never heard this idea expressed before. Graduate courses may well be offered in any university having a dental school, as *optional* work for prospective teachers, investigators, and specialists. This is merely an addition to conventional

opportunity. About fifteen universities are now encouraging graduate work for dentists. Surely no one has ever suggested that graduate work be required of every prospective dentist. But many practitioners need advanced instruction, which they should be encouraged to obtain intermittently.

I feel that Dr. Casto overlooked essential matters when he alluded to "a license for the limitation of practice within a circumscribed field." Dental practice itself is thus successfully limited within the field of health service, and the practice of the dental hygienist has been successfully restricted within dentistry. But the main consideration in a license for a specialist is not the enforcement of a "limitation of practice," but something else that appeals particularly to the layman; namely, a reliable assurance that the one who publicly avows special ability, and superiority over the general practitioner, in a limited field, actually has both that ability and that superiority. On another occasion I referred to this matter as follows:

> [It would be desirable to terminate] "present conditions under which any one who has been admitted to the general practice of dentistry may publicly announce himself to be an expert in a particular branch, irrespective of the validity of his claim. Further abuses of this privilege should be prevented. It would seem to be obvious that any person who has been licensed as a dentist should be free to practise any part of an accredited specialty of dentistry, provided he does so in the ordinary course of his general service, just as under analogous conditions a physician may legally do any act within the field of dentistry, if it is performed in a routine way for the treatment of disease, the relief of suffering, or the removal of disability, although not avowedly as dentistry. But just as a physician, without a license to practise dentistry, may not lawfully represent himself to be a dentist, so also a dentist who may justifiably regard himself as being superior to general practitioners in a particular aspect of the art should be obliged to demonstrate to the state's examiners the validity of such a claim before being permitted to induce the public to believe it. Adequate graduate study. . . . would expedite the most skilful practice of the specialties, and also would fully safeguard the interests of the public and of the profession." [*Bulletin on Dental Education*, 1926, pp. 201–02.]

Dr. Casto has referred to the financial situation in dental education. I shall quote on this subject a statement in the Annual Report of the Carnegie Foundation for 1930:

> "The general increase in academic requirements for admission, by causing prolonged decrease in attendance, has multiplied the financial difficulties of practically all the dental schools. Although thirty-two of the thirty-eight schools in the United States are parts of universities, and three are included in groups of professional schools, only seven have current income from endowment. The amounts of such income, for dental schools in the United States since 1920–21, are shown in *Table 2*, where it may be seen that these additions to current resources have been surprisingly small. The total income from endowment for all the dental schools in the United States, in 1929–30, was much less than

TABLE 2

Amounts of current income from endowment available to dental schools in the United States: 1920–30[1]

	1920–21	1921–22	1922–23	1923–24	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30
California	None	None	None	$549	$589	$570	$579	$562	$560	$560
Columbia	$6,000	$6,000	$6,000	6,550	6,550	6,550	7,696	6,550	1,159[2]	2,825[2]
Harvard	10,420	8,528	9,255	9,218	9,500	10,400	10,534	10,834	16,537	36,475
Northwestern	None	None	66	66	610	1,520	48,758	61,211	53,137	54,677
Pennsylvania	25,000	35,000	34,800	38,664	37,443	37,817	36,946	37,423	38,428	38,672
So. California	None	None	None	None	None	2,770	2,113	2,144	2,513	2,380
Pittsburgh	100	150	150	300	200	None	None	None	None	750
Total	$41,520	$49,678	$50,271	$55,347	$54,892	$59,627	$106,626	$118,724	$112,334	$136,339
Number of schools having current income from endowment	4	4	5	6	6	6	6	6	6	7
Number of schools having no current income from endowment	42	42	41	37	37	38	34	34	34	31
Total number of dental schools	46	46	46	43	43	44	40	40	40	38

[1] Some of the schools in state universities that receive allotments of annual legislative appropriations have, in a sense, equivalents of current income from endowment. In some of the privately endowed universities, dental-school deficits are paid currently from general university income.

[2] The original endowment fund at Columbia was used to aid in the construction of the new building at 630 West 168th Street, as of June 30, 1928. A new endowment fund is now being built up.

that available to each of a number of medical schools in this country. At present a majority of the dental schools are obliged to subsist on fees for tuition and clinical service. Therefore, unable to institute the progressive policies that additional income from endowment would insure, they continue to be weak in teaching, research, and graduate work. The following statement in the preface of the *Bulletin on Dental Education* (p. xx) may be appropriately emphasized by repetition:

"'The dental school is one of the most important of these agencies [for the training of a qualified body of public health servants]. Like the medical school it has long been left to make its way on a commercial basis. Today under the leadership of the best men in the profession it has set its face resolutely toward high service and honorable standards.[21] The facilities for the education it seeks to offer cannot be furnished on a commercial basis. It must have generous financial help, such as has been accorded in the last ten years to many of our medical schools, if it is to carry out its duty to the public health service. There is today no more direct method by which the public health can be served than to enable the universities to place their dental schools in a position to give the kind of education for which the world stands in need. Aid, wisely given to even a few of the more promising schools, will furnish inspiration and incentive sorely needed at this juncture in the cause of dental education.'"

Behind the public appeal for financial aid for the university dental schools that I have just quoted, and behind the data in *Table 2* showing the urgent need for dental endowments in universities, we see one of the obvious reasons for the continuance of many of the deficiencies in dental education and in dental practice. I am sure we all hope that these deficiencies will speedily be removed, and that greater resources, improved understanding, increasingly competent personnel, and deeper educational and professional inspiration, will bless the future of dental education. (Continued on p. 432.)

Milo Hellman, D.D.S., F.A.C.D. (New York City): From the gist of the paper and from the remarks of the last speaker it might be understood that we are perfect. As a profession we are obliged to face all kinds of problems. For example, in participation at the White House Conference for Child Health and Protection, dentistry had the opportunity of its life. How did it respond? We may infer that dental education should reflect the education of the dental profession. A dental committee was appointed to give an estimate, like every other committee that was asked to participate in the conference, of what is known, what is not known, and what should be known about various phases of dentistry. The Dental Committee was "up against it." It didn't know just how to go about it. The first thing they did was to send out questionnaires to the leaders in dental education, and as such

[21] "Under this leadership, the total number of proprietary dental schools in the United States has been reduced from 14 in a total of 46 in 1920–21 to none in a total of 38 in 1929–30. There are six proprietary *medical* schools in the United States."

the deans of the dental colleges were chosen. A letter was sent to each of them with a questionnaire regarding such matters as would be necessary to work out a reliable estimate of dental knowledge. Information was asked on topics like: Time of eruption of teeth; comparison of tooth size with that of the mandible and maxilla; facial characteristics and measurements; irregularity of the teeth; percentage of normal and abnormal in occlusion as it occurs among different children; defects of enamel—pits, fissures, cavities; effects of habit on the dentition; and some other things that are obvious in dental education. The letters received from those who answered read approximately this way: "We have your letter of March so-and-so, enclosing questionnaire. As soon as we can get this information together, we will forward it to you." It never came. Another letter was somewhat as follows: "This is to acknowledge your letter of March so-and-so, enclosing a questionnaire on child health and protection. I regret to advise you that we do not have any statistics available with which your questionnaire may be answered." Another dean answered: "Your letter enclosing a questionnaire for material to be used by the White House Conference on Child Health and Protection was referred to Dr. X and I have just received the enclosed answer to the question which I have the pleasure to forward to you. Regretting that we do not have statistical material which bears upon the subject, and hoping that what has been sent may be of some value, I am," etc. The dean wasn't quite sure that the answer he was enclosing was of any value. This would seem to be a rather sad commentary on the state of knowledge of our deans. The questions asked were definitely on dental subjects and as such the answers should be on the tip of every dentist's tongue. There was absolutely no response at all. It might be asked: What is the matter with dental education?

So far as research is concerned, I am afraid that Dr. Casto is not taking the proper attitude toward it. I am informed that at Western Reserve University some very significant research is being carried out on children's teeth in relation to other bodily conditions. But that research is being done in the medical school and not in the dental; I wonder why. I know that dentistry has progressed tremendously, but I fear that under the present conditions the curriculum will have to undergo considerable metamorphosis to come up to the demands of the times.

Dr. Casto: I wish to clarify one or two points which seem to have been misunderstood. Dr. Gies expressed my views very well in regard to research. I did not deprecate good research, but stated that it was valuable, in fact, necessary. I said that, in an institution such as a dental school

where teaching should be primary and research secondary, teaching should not be subordinated to research, particularly mediocre research. Speaking to the remarks of Dr. Hellman: I am familiar with and appreciate the quality of research that is being done in the university with which I am associated. My remarks were intended to apply in a general way and were not restricted to any institution in particular. Research, unless carried on under proper administrative supervision and thoroughly checked by competent investigators, is of doubtful value and usually is only a waste of time and energy.

Dr. Owre evidently misunderstood the statement I made in regard to the teaching of the basic medical sciences. I said that dental students today were receiving a better education in the medical sciences than medical students received a few years ago. I will go further than that and state that in my opinion, in many *dental* schools where the instruction is being given in the medical laboratories under the supervision of departmental heads, the students are receiving a more comprehensive training in the medical sciences than the medical students are receiving in a number of medical schools. I do not believe that dental educators or dentists in practice are making an attempt to separate, from the whole organism, the special organs with which we are immediately concerned. Contrariwise, the necessity to consider the mouth and teeth in connection with the whole organism is becoming more and more recognized. However, it is safe to predict that if all dental operations which pertain to reparative work are to be performed by mechanics and artisans, a separation of these specific organs seems quite certain. It is probably true that this has already occurred in a certain county in Tennessee, where a man has been licensed to practise dentistry who probably never saw the inside of a dental school. If laws of this kind become dominant throughout the country, we may expect a rapid deterioration of dental education and dental practice.

Something was said in regard to the few dental schools that were fortunate enough to have an endowment. The school with which I am associated receives income from endowment indirectly, which, estimated at about $100,000 a year, comes about in this way. The university is a private institution—it does not receive any financial aid from the municipality or state. The Trustees are obliged, year to year, to meet any deficits that may occur in current running expenses. Each year recently they have paid substantial deficits incurred by the school of dentistry, which may be considered as income from endowment, at least indirectly. The budget of the dental school does not include the full cost of teaching dental students in the medical laboratories. This may also be considered as income from an indirect endowment. The sum of these two contributions constitutes what

may be termed income from an indirect endowment and has been estimated to be approximately the amount mentioned.

I wish to thank the discussors for their comprehensive presentation and consideration. The discussions were interesting and instructive. I appreciate the honor of your invitation to discuss the subject of dental education. The evening has been a very enjoyable one I assure you.

[The President had announced that Dr. Casto would close the discussion, but Dr. Owre indicated a desire to continue it.—*Ed.*]

Dr. Owre: I should like to say that anyone who wants to live in a fool's paradise in relation to this or any other question can of course do so. I prefer stating all the facts on all occasions as far as I know them. I am reminded of the story of the captain of the sailing ship who reported in the log one day that he had found the first mate drunk. The first mate didn't like it very well. The captain said: "It is the truth, isn't it? Yes. Well, then, let it stand." The next day the first mate had the log; and he wrote at the bottom of it: "The Captain is sober." The captain asked him: "What do you put that down for?" The first mate said: "It is the truth, isn't it? Yes. Well, then, let it stand." That is what we must do in connection with dentistry. I have had occasion sometimes to interview philanthropists and representatives of foundations in connection with endowments for dentistry. I found out that you can get support if your set-up is approved by their examining experts. I learned that a few years ago a request had been made for dentistry to a foundation which I know is willing whenever it can to give money to anything it is convinced means a greater service to humanity, if it has confidence in the set-up. The request was for several million dollars. The set-up was examined thoroughly, but no money was given.

I had occasion some ten years ago to try to interest this same foundation in setting up a department of dentistry in a *school of medicine.* Within a few days I was asked to recommend a man. That department has been endowed by the foundation for the last ten years and will be endowed further. A short time ago a medical school had to have a new building. They made out their plans, with 4600 square feet devoted to stomatology. They went to two foundations and requested $2,500,000. They got it. The dean of this institution, with fourteen other medical deans, in Denver last fall asked the question: "What shall we do with dentistry?" Because of lack of facilities for coöperation, medical educators go ahead and plan for dentistry as best they can in the light of what they know. But they all

agreed that they would like to be able to confer with the leading university dental schools as to what should be done with dentistry. Yale University decided that one way to develop it was to secure an endowment for the scientific investigation of the pathology and bacteriology of the mouth. That appealed to the Rockefeller Foundation. They gave them $125,000, and the same amount to Rochester University; the Commonwealth Fund gave Columbia $100,000 or more, with the usual restrictions, for research *through medicine* in dental caries.

It has been mentioned two or three times that dentistry will go out of business if you do so-and-so and so-and-so. We have to face the facts. In this country we have perhaps the greatest infant and maternity mortality of any civilized country in the world. In Sweden they have a very low mortality rate for child birth—only 2 per cent. Why? Because they have studied the problem and organized the institution of midwifery to aid the medical specialist. The midwife is picked for her intelligence, character, and physical strength. She is then trained for twelve months only. The obstetrician is responsible, of course, for her supervision, and for aiding her whenever necessary. North Carolina, except for one county in South Carolina, had the highest rate in the United States. An obstetrician in a North Carolina town went to work to reduce that rate. He engaged two professional nurses and taught them obstetrics. In a short time he was able to deliver over 1000 cases annually at a charge of only $15 to the patient. He reduced the mortality rate to about 2 per cent. The dean who made this report had talked with me several times on what to do with dentistry. I asked him this question: "Don't you think we might have to practise dentistry in the same way; that is, educate a few men who would be responsible because scientifically trained, and then have helpers of various kinds do most of the work in its technical practice?" He said: "Certainly, that is what we must do. There is no other way out." I thought I would feel this out a little more. During my visit to the Congress on Medical Education, Medical Licensure, and Hospitals in Chicago, I asked the same question of ten or twelve men in the leading universities. Several of these universities have no dental schools. They all independently answered the question in the same way. A number of them added that the practice of medicine must be reorganized in the same fashion. Of course we cannot work out all the details of it at once—any more than Plato could have worked out the details of his ideal state.

Dr. Gies: Just a few thoughts in further extension of my remarks. The appeal for freedom to continue "to live in a fool's paradise," as Dr. Owre

put it, is inopportune. This Academy, like the American Association of Dental Schools, cannot interfere with the liberty of its members. Again to restore balance to our judgments, let me remind you of some facts that signify much more than hints and prophecies. In 1920 the University of Rochester established a School of Medicine and Dentistry, having received over $10,000,000 for the purpose, and Dr. Abraham Flexner and others announced in connection therewith that dentistry would be made a specialty of medical practice. In 1925, although no faculty of dentistry had been provided, candidates for the D.D.S. degree were admissible. In 1929, there having been no dental students meanwhile, and no active development of the plan to make dentistry a specialty of medical practice, the proposed plan was wisely discontinued. Now, dentists are admissible to graduate work in the medical sciences and in other relations—very important opportunities at Rochester for specialists, including teachers and investigators. Speaking from extended experience, Dean Whipple of this School, who is also a member of the Board of Trustees of the Rockefeller Foundation, has said:[22]

> "I think it unlikely that physicians, unless they have a particular interest in the border subjects between medicine and dentistry, will maintain a permanent interest in dental research. This interest may be fostered for a period of special grants, but after these grants are used up or the individual matures, he will probably revert to medicine and not be a permanent investment for dentistry. . . . . The nucleus of . . . . [the] research group [for the advancement of dentistry] in my opinion must be dentists who have had the dental training and have a permanent interest in this field, who have taken the time to get additional training in some of the pre-clinical sciences. This of course corresponds to the make-up of the preclinical science group in medicine today. I feel a strong conviction, therefore, that individuals who would help dentistry should first help to develop research workers with dental training and dental interest."

There have been several intimations that dental schools could "get the money" by finding out what certain foundations expect them to do, and then agreeing to do it. It is assumed, apparently, that such expectations would be right because they could not be wrong. It is greatly to the credit of dentistry that dental schools have not engaged in the proposed prostitution. Dr. Owre has learned, from at least one foundation, that there is no desire among "the foundations" to override a profession's convictions regarding its own service and obligations. Dr. Owre began his second discussion by saying he prefers to state "all the facts on all occasions." I called attention to onesidedness in his first discussion. The following

[22] Editorial: *New York Journal of Dentistry*, 1931, i, p. 159.

quotation from the Carnegie Foundation's Annual Report for 1930 presents additional pertinent facts:

"The suggested changes in the status of dentistry come chiefly from a small number of dentists and physicians who believe that the conditions of dental practice in some portions of Europe, where dentistry is in part a specialty of medical practice, are superior to those in the United States. Dentists generally, not only in the United States, but also in most countries, do not agree with this view, and physicians as a group seem to be inattentive to the matter. In 1925, the Section on Stomatology of the American Medical Association, established in 1881 to make the relationship between medical practice and dental practice more intimate, was disbanded chiefly because of lack of interest among physicians in the responsibilities of oral health-service. The American Stomatological Association, which was founded in 1924 to bring about the conversion of dentistry into a specialty of medical practice but which in 1927 abandoned its original purpose, now consists chiefly of physicians. It seeks 'to promote the development of the science of stomatology' and 'to establish and maintain a closer relationship and a better understanding between physicians and dentists.' At the University of Alberta, dentistry has been taught by the Department of Dentistry in the Medical School. This plan, after a trial since 1918, has lately been discontinued and the Dental Department of the Medical School reorganized into a school of dentistry under the general jurisdiction of the Medical Faculty. Intimate cooperation between the teachers of dentistry and medicine will continue. Hereafter dentistry will be taught at Alberta under the guidance and management of leading dentists of the province with the coöperation of members of the Faculty of Medicine. In Canada, where the European organization of dentistry is well understood, the North American plan, in process of development for ninety years, is preferred in each of the five universities having dental schools: Alberta, Dalhousie, McGill, Montreal, and Toronto. During the past year the Medical Faculty of Harvard University issued a volume of 194 pages entitled: *Synopsis of the Practice of Preventive Medicine as Applied in the Basic Medical Sciences and Clinical Instruction at the Harvard Medical School.* Although the full professors in the dental school at Harvard are members of the Medical Faculty, dentistry and all its medical aspects were overlooked in this important book. Medical Schools have not been seeking to absorb, control, or interfere with, dental schools, and are strangely unwilling even to teach the 'medical part' of dentistry to their students of medicine. The accompanying summary presents an indication of the lack of concern, in the medical schools in the United States in 1929–30, about the 'medical part' of dentistry:

Data relating to required instruction in dental relationships, in the United States schools of medicine, in 1929–30

I. Number of schools in which there are no required courses of instruction in oral hygiene, clinical dentistry, or oral surgery 37

II. Number of schools in which there are no required courses of instruction in oral hygiene, clinical dentistry, or oral surgery, but in which casual instruction on dental (oral) conditions is included in required courses or clinical work in other relations 29

III. Number of schools that give required courses or groups of lectures on various

aspects of dentistry, the time allowance ranging between four and fifteen hours (average, eight hours in four years)[22] 15

IV. Total number (including the six proprietary schools) 81

V. Number of schools in Group III in 1924–25—a gain of six in five years 9

If interest in the 'medical part' of dentistry continues at its present rate of growth in the medical schools in the United States, and if the number remains the same, then it may be expected that by 1985 all of the medical schools will devote an average total of eight hours in the entire curriculum to required work in dental and oral relationships."

Dr. Owre said (p. 389) that "*leading medical schools . . . . are now deeply concerned with the place dentistry is to have in the scheme of education. It is not at all a matter of indifference to them*" [italic in the original]. He also stated (p. 431) that fifteen "medical deans in Denver last fall asked the question: 'What shall we [*sic*] do with dentistry?" The data quoted above from the Carnegie Foundation's Annual Report seem to "speak louder than words." You have been told much about what *medical* deans are going to "do *with* dentistry," but have heard no intimations that the convictions of dental deans or of dentists collectively may not be suitably disregarded in this situation. The medical profession shows no inclination to engage in the unethical and unsportsmanlike procedure of forcing dentistry into a status that would be unwelcome to dentists. Until "organized medicine" demonstrates unmistakeably to dentists that dentistry would be developed more fully to *public advantage* as a specialty of medical practice than as an independent specialty, the *public interest* will require that dentistry be *continued* as a separately organized profession. Any prospective change from the latter status to the former should be satisfactory to both professions, *speaking through qualified and authorized representatives*. If a university education for the practice of dentistry does not qualify dentists collectively to determine the status, and guide the evolution, of dentistry, can any other group, not so educated, be more competent to do so? The answer of disinterested laymen to this question is "No."

Dentistry is obviously a natural division of medicine (health service), but not a specialty of medical practice. Dental schools are steadily improving the instruction of their students in the so-called "medical" sciences and in the correlations with clinical medicine, in an earnest endeavor, with the generous help of medical faculties, to make dentistry the *full health-service equivalent* of an oral specialty of medical practice. This is being accomplished without destroying the dental profession or disorganizing the

[22] "The 15 medical schools in Group III are Boston, Cincinnati, Creighton, Detroit, Emory, Georgetown, Kansas, Marquette, Medical Evangelists, Minnesota, New York Homeopathic, Ohio State, Oregon, Temple, Washington."

medical profession. The attainment of health-service equivalence, as projected, would give to the patient the best in dental practice that might be afforded under any other professional organization or auspices. *This is the essential consideration.* Meanwhile, physicians, although generously co-operating, are leaving to dentists, and their co-workers in the basic sciences, the solution of problems of dental practice and of dental education. This is plainly, and fairly, as it should be. Dentists may be expected to give to their profession a full measure of devotion.

Bissell B. Palmer, D.D.S., F.A.C.D. (New York City): I wish to express my gratification at the type of meeting we have had tonight, and to extend congratulations to the committee that arranged the program. I think in years to come the record of tonight's meeting will prove that this has been an historical night. I move that we rise in appreciation of the essayist's paper and of the contributions to the discussion. [The audience then arose (11:55 p.m.) and applauded.]

INTERNATIONAL ASSOCIATION FOR DENTAL RESEARCH

Scientific Proceedings of the Ninth General Meeting[1]

Hotel Peabody, Memphis, Tennessee
March 21 and 22, 1931

Compiled by WILLIAM J. GIES, F.A.C.D., *Secretary*[2]

Columbia University, New York City

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[1] The sessions of the Research Association preceded, by agreement, those of the Eighth Annual Meeting of the American Association of Dental Schools, in the same rooms on March 23–25. The members of each body were welcome at, and participated in, the sessions of both associations. The chairmen were the President, Dr. U. G. Rickert, Dental School, University of Michigan, the Vice-president, Dr. R. W. Bunting, Dental School, University of Michigan, and the President-elect, Dr. A. E. Webster, Dental School, University of Toronto. The annual informal dinner, served to members and guests on the evening of March 22, was attended by 87 persons. An account of the executive proceedings will be published in the Supplement of this volume, in the number for December, 1931. Abstracts of the papers presented at the general meeting in 1930 were published in the *Journal of Dental Research*, 1930, x, pp. 367–419; June.

[2] Most of the abstracts have been prepared by those who presented the corresponding papers. All revisions have been verified by the authors.

I. President's Address[3]

Several Urgent Problems in Dental Research

U. Garfield Rickert, M.S., D.D.S., F.A.C.D., School of Dentistry, University of Michigan, Ann Arbor, Mich.

It was at a White House dinner. Sir Cecil Spring Rice, the British Ambassador, was seated beside the Governor of New York. Inspired by the galaxy of celebrities and the magnificence of the event, Sir Cecil turned and said, "Governor, what do you think is the most wonderful thing in all the world?" The Governor quickly replied "A baby, because in the infant we have the greatest potentiality for power and achievement of all worldly possibilities." These little masses of protoplasm have always fascinated me with their potentialities. When they first strike this planet they look and respond instinctively to all external stimuli, much alike. This similarity of development, both physical and intellectual may go on for months; yes, even years, without notable differences. For some unknown reason at about the twentieth year physical growth ceases. With the large majority of our population the capacity for intellectual achievement is about complete at that age. It is from these individuals that the rank and file of our common, everyday people are recruited. They carry on generation after generation, capable of meeting their environmental conditions and of providing for their immediate physical wants. Another group, fortunately much smaller, have an arrested intellectual development terminating before the end of the physical growth period. Some of these, the imbeciles and morons, become our public charges. It is not with either of these groups that I am especially concerned tonight. It is rather with that small minority whose intellectual development continues long after the physical growth period ceases. They become our geniuses, our Pasteurs, Edisons, Einsteins, Washingtons, Lincolns and Roosevelts.

To the members of the Research Association I desire to express my deep appreciation for the honor and privilege of being entrusted with the chief guardianship of this, the most recent arrival and child of dentistry. To watch this "young hopeful" as it was learning to creep

[3] Read at the dinner preceding the sixth session. See page 495.

has been most satisfying. We now have seen it take its first few forward steps. May it never step backward. We trust that, like the geniuses cited above, it will in its maturity lead us from much of the wilderness and darkness of opinion and theory to the illuminated field of more exact knowledge. With proper nurturing and adequate financial security, which we its foster parents must in some way provide, its future success will be assured. The official journal, where its achievements should be recorded, must have our constant concern and moral support. It should have the necessary financial security and protection to prevent its ever becoming a smoke screen for advertisers more concerned with private financial success than with scientific achievement.

I am fully conscious of the fact that all orthodox addresses, especially those of retiring presidents, should present some threatening and chaotic conditions of which only the speaker is supposed to be aware. It is not for this reason that I engage in somewhat similar tactics. Since the downfall of Scholasticism and the beginnings of the Renaissance there have always been progressive movements in development. The social, industrial, financial and political eruptions of the present time are unique only in that they are world wide in scope, and affect more people than at any time before. These movements are so all inclusive that we could hardly expect our professional life to remain undisturbed by them. Wisdom and the exigencies of the time demand that we be more concerned with the more equitable distribution of our services than with immediate innovations in technical procedure. The fact that only one out of five of our people can avail themselves of dental services is the most urgent situation demanding correction that confronts the profession, if we are to exist as a real health service. With a leadership such as we have a right to expect in the two organizations in session here, with a full consciousness of what is going on in our adjustment to a more advanced social state, we should have no fear for the future of our profession. We are developing in this Association teachers and research workers who should be able intelligently to direct and guide our services to the greater advantages of both the public and the profession. Each year we hear more discouraged leaders in the field of dental education grant that this ten year old prodigy is the most promising single influence we have at this

time. I shall devote the remaining part of this address to the several urgent research problems with which I am most familiar. The length and scope of the program presented here, the carefully controlled statements as to completion and finality of the data presented, give ample evidence that this Association will have a sufficient number of subjects with which to busy itself for many years.

We have certain research problems concerned with focal infections that are unique in their approach. To illustrate, the material and cultures that may be obtained from pulp canals of teeth quite readily are much more difficult to procure uncontaminated than from other organs, if they are to be had at all. Because of this fact, in the study of the infectious type of arthritis the dentist has an unusual opportunity to make his contribution. Then, too, with the diseases of the eye when associated with infections of the teeth we have a most accessible condition for study. Due to its transparency and the availability of modern instruments it is almost possible to make microscopic studies in vitro of certain structures within the eye. The slightest changes may be immediately observed. The accessibility of these two organs, and the frequency with which the evidence indicates that dental affections initiate one or another of the diseases of the eye, makes it possible for the dental investigator in this instance to study the focal infection problem under the most unusual conditions.

The focal infection problem

I am sure you will all agree that the focal infection problem, in its many aspects, has been the most interesting and extensive subject of research ever undertaken by the dental profession. There is still so much confusion and so much difference of opinion expressed both from clinical and research experience, especially in America, that the Europeans have insisted that at the International Congress to be held in Paris this summer, this should be one of four major subjects presented in general session. The Europeans never have been able to understand the American viewpoint. In fact they have frequently spoken of the focal infection concept as an "American fad and theory." Many of the most eminent pathologists in Europe still deny that there is anything more to the idea of focal infection than the common principle of infection which was long ago established.

Before discussing the evidences for and against the focal infection concept I will present several conditions which may explain in part why the subject attracted so much more attention in America than it did in Europe. Until twenty-five years ago American dentistry was largely a mechanical art. Its research activities, with few notable exceptions, were directed towards the improvement of the aesthetic and functional stability of its restorations. It had so long been divorced from medicine and the allied sciences that, in its mechanical prowess, it had advanced altogether too far beyond its biological understanding. Vital pulps were removed promiscuously. As late as 1916 approximately 90 per cent of patients visiting our large dental clinic had one or more pulpless teeth. It must be said, however, to the credit of the American dentist that he did educate his public to a greater appreciation of dental services than did the dentists of many other countries. The more general acceptance of dental services in America by nearly all classes, coupled with the less drastic root surgery methods of Europe, made the roentgenographic evidence less conspicuous and prominent abroad. This may, in part, account for the difference of viewpoint.

This Paris report, which I have been asked to write and for which I will need your sympathy, is to contain all of the evidences indicating and proving if possible that infected teeth may, as primary foci, initiate secondary foci in other parts of the body. This evidence is to be taken from the published reports of the most outstanding research workers. The purpose of the investigation is to place the whole focal infection theory on trial with all of the evidences for and against it presented, and finally to compare the conclusions with my own personal experimental studies. I doubt whether the committee realized what an enormous task it was going to be to make so extensive a review for so brief a report. MacNevin and Vaughan, who recently published the first volume of a work entitled "Mouth Infections and Their Relation to Systemic Diseases," state in their preface that they reviewed many thousands of manuscripts and regretted that in their final melting pot all of them could not be included. They present a bibliography of 1781 names. I mention this here because it indicates the unusual interest that has been shown in the subject, and the difficulty of anyone's ever making a complete review of the work of all the students who have devoted time and attention to the problem.

In this report I have studied many European and American contributions to the subject. The American writers have given such an unusual amount of evidence that it has seemed best to classify all of this material under four headings. In order of importance and frequency with which they occur, they are circumstantial, experimental, statistical and outright garnished opinion. A brief outline of each follows.

Circumstantial evidence. By far the greater part of all the evidence presented is an attempt to prove this relation by case history reports. In a study of these reports by scientifically trained observers it is noted that important features of the observations have usually been omitted such as, definite diagnoses and the length of time following elimination in which the patient remained well. Since many of the diseases described as being focal in origin are of the fluctuating type, there is no evidence submitted that there would not have been a favorable change even if no treatment had been administered. While much of this uncontrolled evidence is highly convincing it still fails to prove definitely the correlation of the dental infection to the systemic disease.

Experimental evidence. Later in our investigations it was believed that certain experimental evidences, coupled with the more circumstantial evidences such as case history observations, might more definitely prove the correlations. Indeed when, as proved by laboratory cultures, dental infections were removed, and certain immediate health improvements followed, and the psychological element was ruled out as far as possible—this combination of evidences made the possible relation more convincing. The frequency, however, with which there was recurrence after a few months of temporary relief from the supposed secondary effect made even this better controlled evidence doubtful. The inconsistency of results when patients with identical clinical pictures had complete extractions, added still more confusion. Another experimental study which offered us more definite proof is the organ virulence theory of Eisenberg. This theory, though not generally accepted, has recently been gaining adherents both in this country and in Europe. It has more recently been revived and popularized by E. C. Rosenow and Frank Billings as the elective localization theory with which you are all familiar; that is, that by the intravenous inoculation of laboratory animals in a large percentage of

cases, lesions, similar, and in location identical, to those of the patient from whom the culture was taken, may be produced. Many bacteriologists have failed to get a high percentage of localizations. The frequency of non-specific foci in the inoculated animals, the large dosages injected, the spontaneous lesions so frequently observed even in the control animals, have in the minds of many exacting investigators thrown doubt upon this work.

The Europeans, until recently, have been skeptical as to what many spoke of as the "excessive claims" of Rosenow and his school but, from the recent literature, it is evident that in France, Germany, Norway and Sweden, renewed investigations are in progress which, from preliminary reports, would indicate more acceptance as to its possibilities, at least in the above mentioned countries. Sedallion and Nicolau, two French investigators, have recently reported an experiment substantiating, to a certain extent, Rosenow's viewpoint. Because of the permanence of the elective adaptation, and because of the two different tissue adaptations with the same strain in the one animal, one of their experiments is sufficiently interesting for a brief outline. From a strain of pneumococcus that killed a white mouse in 48 hours, some of the cerebral substance was removed, the pneumococcus recovered in a pure state and mixed with bouillon. Cultures were placed in capillary tubes and preserved in a refrigerator. After five months this substance was injected hypodermically in fifteen mice. Of these, 13 gave positive pneumococcic cultures in the brain within twenty-four hours, but the blood was negative in all but two. After 36 hours the organisms appeared in the blood and still remained abundant in the brain. The heart blood taken from the first mouse and retained for five months produced septicemia in all cases in 24 hours without particular localization in the brain. These cultures lost their elective adaptation after 20 to 25 transplants on artificial media. If the substance is again placed in the brain of a mouse and sealed in the capillary tubes it will gain its elective adaptation in less time—the time quoted is one and one-half months. The authors conclude that next to the quantitative virulence and receptivity of the animal to infection by a germ it seems that one should take greater account of the acquired and transitory tissue adaptation of the virulent germ.

Forssner's evidence as presented for kidney tissue by strains of

streptococci, and Schmitz', long ago reported as adaptations to muscular tissues by certain strains of staphylococci, are again being reviewed and studied by European pathologists. The inadequate method of definite classification of strains, the enormous invasive powers of streptococci, the most prominent group involved, and the fact that one can seldom prove which of these infections is the primary focus, again leaves us without complete proof.

Statistical evidence. Perhaps none of the evidence presented here has been followed with equally contradictory results. From statistics compiled in the United States War Department publication, "Defects Found in Drafted Men," some observers noted a much higher incidence of probable secondary effect in regions where defective teeth were most prevelant, as compared to those of lesser incidence. Dr. Appleton, considering the other possible cephalic foci, and using the same compilation of medical examinations computed from more than one half of the recruits of the American forces, failed to observe such correlation. Dr. Appleton's study was more nearly in accord with the data of Fraenkel. The latter used the statistics of 17000 medical examinations of policy holders of the Metropolitan Life Insurance Company of New York. He compared the general health data of those with less evidence of possible dental infection with those having greater evidence. He also came to the conclusion of negligible differences.

In a sense, the statistical tables that have been given by many investigators, notably Rosenow and his school and Weston A. Price and others, have shown that inoculated laboratory animals will produce in a much higher percentage the specific lesions of the patient from whom the strain was taken, than they will when the strains are from normal patients. While not conclusive, it is, to say the least, convincing evidence.

It appears, then, that statistics so far have failed to prove much for or against the evidence under consideration. In fact, statistics have their most rational dental use in prosthetics. When patients with full dentures can accurately pronounce the word statistics the restorations may be considered successful.

Garnished opinion. Early in the investigation of the focal infection problem, before dentistry had had the time or opportunity to attract

a sufficient number of trained observers and experimental workers to this field of investigation, volumes were written that can be labeled in no other way than out-right garnished opinion. These reports consisted largely of compilations of opinions of other observers who agreed with the opinions of the writer and completely ignored any evidence from the literature opposed to his own viewpoint. The unfortunate part of this evidence was that it was presented before serious, interested practitioners of dentistry who were desirous of knowing the truth. This resulted in even greater confusion within the profession. Because of this unsettled state the general practitioner still can go on practising any form of radicalism or ultra-conservatism that best meets his tastes and needs, while the public suffers. Whatever course he takes in his clinical practices, there will be ample support for his methods in the literature presented as research. Just as long as roentgenologists, serologists, bacteriologists and pathologists each give about as much negative evidence for all their positive findings this confusion will continue. We believe that this young hopeful [Association], however, will eventually dredge the channel and steer the fleet of dental services into the proper course. In this way we will be neither stranded on the sandbars of ultra-conservatism on the one side nor dashed to pieces on the treacherous rocks of ultra-radicalism on the other. It is true that in surveying this course soundings will have to be made, but this is the work of the surveyor, the research worker, not the ship's crew.

You may ask, in view of what has been said so far: What evidences would prove that dental infections may or do initiate secondary foci, what evidences will be acceptable to the most critical scientific observer, and finally how near have I come in my own work to approximating this concept of proof? In answer to the first question there should be general agreement that the theory has advanced to an established fact when a number of competent, unprejudiced observers can consistently verify the following specifications. The only cases to be considered will be those in which definite diagnoses of the suspected secondary involvement can be made. If, on adequately controlled treatment or extraction, the patient completely and permanently recovers from the suspected secondary effect, the evidence becomes highly convincing. Cultures must be made and so controlled

that there can be no question of contamination. Whenever possible these cultures should be made from both the suspected primary and secondary foci. Now if we were to take these cultures and inoculate traumatized teeth of an adequate number of laboratory animals, and consistently produced the disease or specific lesion in question, the case would be proved to something less than one hundred per cent. If the culture consistently produced the secondary effect when we substituted the human for the laboratory animal, we would have approximately one hundred per cent proof. For obvious reasons, however, the final and most conclusive evidence has been impossible to obtain. With the exception of this last step the evidence has been completed by many investigators, even to the apparent specific localizations in laboratory animals. Every one will agree that all infections should be removed as far as possible even though the dental focus is not proved the initial focus.

It is not, however, with the immediate clinical aspects that we are concerned in this report. It is rather with the original thesis: is the proof as yet conclusive that teeth may and do, as primary foci of infection, establish secondary foci by metastasis. We all probably believe they do but the membership of this Association is fortunately no longer interested in opinion. It demands proved facts. This trend is everywhere in evidence. As stated above if we could substitute susceptible humans for the experimental animals such evidence would be acceptable to the most exacting observers. For obvious reasons this method is, as a rule, impracticable. While the experiment I am about to present to you has not been tried on a sufficient number of cases to be conclusive it does, we believe, come somewhat closer to the mark than the experimental work carried out only on laboratory animals. We have selected for the better controlled experiment cases of eye involvements, acute myositis and neuritis; conditions in which either toxins or allergy are probable factors. When the pulp chambers of suspected teeth in patients of this type are first opened and very mild antiseptics are used instead of the powerful disinfectants, and if one avoids forcing the dead-pulp contents into the periapical region, many times the acute symptoms will be relieved within thirty hours. If the antiseptic has been properly selected and is not repeated for several days, there will be recurrence of the symptoms. I have in this way induced and relieved these secondary symptoms repeatedly at will over a period of several months.

In a severe case of myositis of about six weeks duration an upper second molar, in which the buccal root pulps were alive and pulp tissue of the palatal root putrescent, was found to be the focus of infection. When the tooth was located, cultures were made of the putrescent canal. Because of experimental purposes, I did not wish to destroy the vital pulps in the two buccal canals at the time. I protected these vital pulp stumps with a suitable capping and used a very mild antiseptic in the lingual root canal. On the following day all symptoms of the myositis had disappeared. I grew the cultures, intending to wait several days and then seal about a half million organisms in the lingual root to see if I could reestablish the secondary effect. (This being a tooth in my own mouth I felt no hesitancy in doing this.) With the mild antiseptic I used I found that it would relieve the secondary pains for about two or three days, after which there always was recurrence, without innoculation with the organisms. In this way I could at will relieve and induce the mildly painful symptoms, unless the antiseptic was renewed. With the extraction of the tooth, after several months of experimental study, there has been no recurrence during a period of six years. These same observations have also been made in a number of cases of iritis. Experiments of this kind and the complete cures of interstitial keratitis that I have observed when the specific pulp canal infection has been located and removed, sometimes after a number of harmless teeth have been extracted, come the nearest of all our work to proving the one hundred per cent etiologic relation in question. We acknowledge, however, that many European pathologists would still be skeptical of even this experiment.

The focal infection question has been presented to you with the idea of further interesting members of the Association in studies of the unsolved aspects. There are several phases of the problem that have a direct bearing on the incidence of dental infections which should be attractive to other investigators. Of prime importance among these is the protection of pulps under all forms of restorations. The solution to this question is likely to be found in more adequate treatment and protection of the dentine that comes in immediate contact with metallic fillings. Dr. M. D. Mackey, working in my laboratory, opened many pulp chambers of the teeth of patients of all ages, some with no fillings, others with large fillings. We were both amazed at

the general prevalence of pulp degenerations in teeth with large restorations. These were especially evident under the large and sometimes leaky amalgam fillings. The ease with which embolic infections may take place in such pulps must be apparent to all of you. The high percentage of these degenerating pulps that prove infected on culturing is appalling. This, coupled with the fact that some of the finest instances of specific localizations in laboratory animals that we have so far observed have been taken from these degenerating vital pulps, makes this type of infection a most interesting subject of study. Are they active or passive in effect? A second phase of this problem is concerned with the high percentage of dead pulps under silicate fillings. The manufacturers have persistently held to the view that these pulps would not have died if the operator had been more painstaking in the selection of cases, in the cavity preparation and the filling technique. While there may be some truth in their statements the fact remains that either the technique of a large part of the dental profession is at fault or there is still some form of insulation required that has not as yet been mastered.

We are at the present time interested in the development of a cavity liner which will give a minimum shock to the pulp when the dentine is freshly exposed, and which will insulate the contact between the filling and the dentine as further protection. The significance and importance of this question is evident to many of our outstanding operative dentists. The authors of a textbook soon to be published have also been much concerned with this problem of greater protection of pulps. They have appealed to all of the investigators who have expressed an interest in this subject, asking for their contributions. One is impressed, in an analysis of all methods so far presented, by the empirical conglomeration of the substances used. The most desirable features of such a cavity liner are that it should be colorless, of such a consistency that it may be thinned to any desired degree, insoluble to the circulatory elements, unaffected by moisture, a non-conductor of electricity, a low heat conductor, a non-irritant and very cohesive. The study we have made for a suitable material has always failed to meet one or another of these requirements. Some of the cellulose, Bakelite and chemically related varnishes have merit, but lack at least one of these features. When a much lower heat treatment is required for the curing of Bakelite and other chemically allied prod-

ucts our problem will be solved. We have here an excellent subject for further study.

Conclusion. From the tentative program it is evident that the various aspects of the caries problem are already being carefully studied. The focal infection problem, second in importance only to the caries problem, has been presented to you for the purpose of bringing to your attention some aspects of the question which are still not definitely proved and which require much further study. I am fully aware, too, that every contributor to this program has in his studies observed phenomena closely allied to his problem in which most promising leads are available when time and facilities permit of their further investigation.

With increasing membership in this Association, which is capable of an output of higher quality and quantity each year, this child of dentistry becomes the most hopeful influence in the security and advancement of the dental profession. The time has come for this ten year old international prodigy, like all well-bred youths of the time, to complete its education and add to its culture by foreign travel and study. Because of its tender years it has seemed best to begin its world experience, on its first venture from the land of its nativity, in the nearest foreign country. We are permitting this first sojourn without fear or hesitation for, as long as the 5-5-3 naval parity exists, its protection should be as adequate under the Union Jack as under the Stars and Stripes.

It gives me great pleasure, then, to entrust the guidance and chief guardianship of our "young hopeful" to Dr. A. E. Webster, of Toronto, Canada.

Response by President Webster

I accept with feelings of gratitude and trepidation, the high honor of being made President of this Association. I am grateful to those who have thought sufficiently well of me to support me for the honor, and I accept it with the full knowledge of my limitations. But at the same time I appreciate the fact that if I only have sense enough to rest my troubles on the efficient Secretary and other officers, all will be well. As I take office I recognize that, within the year, the Association must continue to adapt itself to a widening sphere of activity. I again thank the members for the honor conferred upon me.

TABLE 1 (CHART II)

Data relating to the diet of Eskimo of North Bering Sea and Arctic Alaska

LOCATION	APPROXIMATE PERCENTAGE CONSUMPTION			VEGETABLES						
	Fats	Proteins	Carbohydrates	Wild?	Cooked or raw?	Description; quantity	Gardens?	Tinned vegetables?	Kind and quantity	Other information
*Nome	30	35	35	Yes	Raw		No	Occasionally		
*Nome	30	40	30	Yes	Raw	Small quantity	No	Yes		
*White Mt.	50	30	20	Some	Raw	Sour dock, berries	No	Very little	Negligible	
**White Mt.	55	25	20		Cooked	Potatoes, onions, wild potatoes	No	Very little	Corn, tomatoes	Prefer fruits
*St. Michael				Yes	Both	Greens in seal oil	No	Moderately		
**St. Michael	50	30	20	Yes	Both	Potatoes, native herbs	No	Some	Tomatoes, spinach	
**St. Michael	Large	Large	Small	Yes	Raw, except potatoes	Potatoes, onions, berries	No	Very little	Tomatoes	Canned too expensive
**Stebbins	60	25	15	Yes	Raw mostly	Wild celery, mustard reeds	No	No		Native fruits, cranberries, salmon berries, moss, heather and blueberries
*Gambell, St. Lawrence Island	20	60	20	Yes	Both	Roots, seaweed	No	Small quantity		Fruits, dried and canned
*Sevoonga—St. Lawrence Island	25	50	25	Yes	Both	Sea and land vegetation	No	Yes		
**Sevoonga—St. Lawrence Island	25	50	25	Yes			No	Yes	Sweet potatoes, corn, peas, tomatoes, pork and beans	

*St. Lawrence Island—general....	50	30	20	Yes	Both	Berries, tubers, wild potatoes	No	Large quantity	Peas and corn	
**King Island.....	35	50	15	Yes	5% cooked	Native greens preserved in seal oil, eaten raw	No	Yes	Few tomatoes	
**King Island.....	30	50	20	Yes	Both	Ten varieties wild herbs and roots grow on island	No	No		Urged to eat vegetables. Consume equivalent to 12 cans per year per adult
*Reindeer Station...	25	60	15	Yes	Raw	Wild onions	No	Very little		Tinned fruits and jellies preferred
**Igloo (Mary's)....	65	35	0	No	No		No	No		Frozen fish dipped in seal oil. Native cranberries, black and salmon berries
**Cape Prince of Wales.....	50	25	25	Yes	Raw	Willow buds	No	Very little	Tomatoes, onions preferred	About six vegetable meals per person per year
**Cape Prince of Wales.....				Leaves	Raw	Cooked and preserved in seal oil		Few	Beans, corn	
*Little Diomede....	50	25	25	Yes	Both	All they can get	No	Very little	Quantity negligible	
**Little Diomede...	40	50	10	Yes	Both	Wild potatoes, green	No	No	None	
*Kotzebue.....	20	50	30	Greens	Cooked		Few	Not much		
*Noatak.....				Yes	Cooked	Onions	No	Some		
*Tigara.....	60	20	20	Roots	Raw		No	Very few		Like bacon and candy
*Point Hope.....	55	15	30	No			No	Mostly too expensive		

* 1929.
** 1930.

TABLE 1 (CHART II)—*Concluded*

LOCATION	APPROXIMATE PERCENTAGE CONSUMPTION			VEGETABLES						
	Fats	Proteins	Carbohydrates	Wild?	Cooked or raw?	Description; quantity	Gardens?	Tinned vegetables?	Kind and quantity	Other information
*Point Barrow.....	66		34	No			No	Very seldom	Beets and potatoes	
*Point Barrow.....	30	50	20	No			No	Yes	Soups, sweet potatoes, peas and corn	
*Wainwright.....	40	40	20	No			No	Seldom	Corn, tomatoes	Want canned fruit in trade
**Buckland.....	50	35	15	Yes	Mostly cooked	Potatoes, onions, fresh and evaporated	No	Like them but too expensive	Tomatoes, corn	Roots and leaves gathered in season; preserved in oil
**Deering.....	50	42	8	Yes	Cooked mostly	Potatoes	50%	As much as can afford	Peaches	
**Deering.....	40	45	15	Yes	Cooked	Potatoes, turnips		Few		Fond of tinned vegetables and fruits, but cost prohibitive
[1]*Alaska (general average).....	30	45	25	Yes	Raw	Seaweed and summer greens	No	Rarely	Cannot estimate	
[2]**Alaska (general average).....	30	50	20	Yes	Raw	Greens, wild celery, rhubarb	No	Yes	Beans, corn, tomatoes, potatoes, asparagus	

[1] Dr. J. B. McAuliffe, Surgeon, United States Public Health Service; detailed to Coast Guard Cutter Northland, 1929.
[2] Dr. C. E. Bingman, Surgeon, United States Public Health Service; detailed to Coast Guard Cutter Northland, 1930.

II. First Session: Morning, March 21; Abstracts 1–13

1. A study of the nutrition and teeth of the Eskimo of North Bering Sea and Arctic Alaska[4]

Leuman M. Waugh, D.D.S., F.A.C.D., Dental Surgeon (R) United States Public Health Service; Associate Dean and Professor of Orthodontia, School of Dentistry, Columbia University, New York City

On May 28, 1930, the writer was again ordered to active duty under the terms of his commission as a dental officer in the Reserve Corps of the U. S. Public Health Service, and detailed to the U. S. Coast Guard for duty on board the Coast Guard Cutter Northland. This detail afforded opportunity for the continuance of a study of dental conditions of the Eskimo of North America. From 1924 to 1927 the summer months had been utilized for a survey of the Eskimo of Labrador.[5] This assignment was again received with keen anticipation because it afforded continued opportunity to compare dietary habits, mental and physical traits, as well as dental conditions, of the Eskimo of Arctic Alaska.

Because of the very kindly interest of Rear Admiral F. C. Billard of the U. S. Coast Guard, and Captain E. D. Jones, U. S. Coast Guard Cutter Northland, it was possible for me to visit over twice as many native settlements, and to examine and record conditions in more than three times as many natives, as in 1929. The same questionnaire was used,[6] and much corroborative and additional information was gathered and tabulated in the form of six charts. The two bearing on foods and teeth are presented in *Tables 1* and *2*. The estimated *Eskimo* population of the Alaska settlements named in the *Tables* are given below for 1929 (except as otherwise indicated): Buckland, 125; Cape Prince of Wales, 174; Deering, 150; Gambell, 225; Igloo, few; King Island, 168; Kotzebue, 2000; Little Diomede, 130; Noatak, 225; Nome, 300; Point Barrow, 300; Point Hope(?); Reindeer Station, 100; Sevoonga, 120 (1929), 135 (1930); St. Lawrence Island, general, 275; St. Michael, 230 (1929), 300 (1930); Stebbins, 109; Tigara (?); Wainwright, 260; White Mountain, 186 (1929), 207 (1930).

[4] A full report of the study will be published by the U. S. Public Health Service.

[5] Waugh: *Journal of Dental Research*, 1930, x, p. 387.

[6] Waugh: *Ibid.*, p. 391.

TABLE 2 (CHART III)

Data relating to the teeth of Eskimo of North Bering Sea and Arctic Alaska

LOCATION	TOOTH TROUBLES?	HOW OVERCOME?	TEETH OF OLD GENERALLY SUPERIOR?	REASON FOR SUPERIORITY?	TEETH CLEANED?	IF SO, HOW?	ANYTHING ELSE BEARING ON SUBJECT
*Nome	Younger generation suffers		Yes	Diet	Seldom		
*Nome	Yes		Yes				
*White Mt.	Yes	Extraction	Yes	Change of diet	Children, yes; adults, no		Children taught in school. Older natives negligent
**White Mt.	Much	Extraction	Yes	Too many sweets	No		Teeth very hard, brittle
*St. Michael	Yes		Yes	Sweets	Yes		Children taught; do well while at school
**St. Michael	Yes	Extraction and treatment by dental surgeon aboard Northland, 1929–1930	Yes	Change in diet	Very few	Taught in school; cotton or gauze with soda or salt	Brushes misused; free distribution discontinued
**St. Michael	Much	Extraction	Decidedly so	Changed food habits; much candy eaten by children	Seldom	Brush and dentifrices	Vast improvement with regular dental inspection. Dentist much needed in district
**Stebbins	Yes	Dental surgeon aboard Northland; first visit in 1930	Yes	More sweets; less chewing	Very few	Brush	Northland dentist examined 109; dental treatment for 32

*Gambell—St. Lawrence Island	Yes	Extraction					School children given brushes
*Sevoonga—St. Lawrence Island	Yes	Extraction	Think so	Soft, sweet foods	Yes	Reindeer sinew used like dental floss	Children clean teeth daily in school; six families use brush
**Sevoonga—St. Lawrence Island	Yes	Extraction prior to 1929. Dental surgeon aboard Northland filled many teeth, 1929–30	Yes	Sweets and soft store foods	Very few; some never	Dental floss and brush	
*St. Lawrence Island—general	Yes	Extraction	Yes	Use of sugar	Yes		School children taught to care for teeth
**King Island	Some	Extraction	Very much	Too many sweets	Younger generation	Tooth brushes	
**King Island	Adults little; children much	Extraction	Decidedly	Soft foods; lack of use of teeth as tools	No		Like pancakes and rolled oats instead of dry meat
*Teller Mission: Reindeer Station	All children suffer	Extraction	Decidedly	Store food; lack of use	No		Children taught to brush teeth; women wear teeth down sewing with them

* 1929.
** 1930.

TABLE 2 (CHART III)—*Concluded*

LOCATION	TOOTH TROUBLES?	HOW OVERCOME?	TEETH OF OLD GENERALLY SUPERIOR?	REASON FOR SUPERIORITY?	TEETH CLEANED?	IF SO, HOW?	ANYTHING ELSE BEARING ON SUBJECT
**Igloo (Mary's).....	Not until recently		Decidedly	Carbohydrate food; lack of chewing	No		In medical practice, 1900 to 1906, saw no tooth troubles. Became very common during past ten years
**Cape Prince of Wales.....	Few	Extraction, and packed with tooth gum	Yes, but worn down	Candy, poor care; insufficient food and lack of variety	Young people irregularly	Brush and paste, if provided by Government	
*Little Diomede.....	Yes	Extraction	Yes	Change of food	Sometimes	Brush	
**Little Diomede.....	Whole lot	Extraction	Yes	Soft food	No		
*Kotzebue.....	Some	Suffer or extract	Think they are	White man's food	Rarely		Some have tooth brush
*Noatak.....	No				Yes		Some young people do brush; adult's teeth worn down
*Tigara.....	Children, not adults	Extraction	Yes	White man's food	Yes	Ivory toothpick	Use toothache drops
*Point Hope.....	Mostly in children	Mostly extraction	Yes	Mixed diet	Some do	Brush and dentifrice	Annual visit of Northland dentist of untold value; 1929, 1930
*Point Barrow.....	Yes	At hospital and on Northland	Yes	Sugar and sweets	Yes	Brushes and paste distributed by hospital	When teeth are lost, indigestion becomes common
*Point Barrow.....		Go to physician	Yes	Sugar, flour, candy	Not regularly	Brushing	

*Wainwright.....	No	Teacher or physician extracts	All have good teeth	Food	Seldom	Walrus whiskers as toothpicks	Older women's teeth worn to gums—Muklak soles
**Buckland.....	Slightly	Extraction	Yes	Less coarse food; less vigorous use of teeth in making equipment	Once a year during Health Week	Modern paste and brushes	Younger generations do not chew raw hide for apparel like elders did; manufactured substitutes available
**Deering.....	Adults little, children and half breeds much	Travelling dentist before 1930; on Northland, 1930	Decidedly		Not much	Brush	Younger generation taught in schools to clean teeth
*Alaska: general.....	Yes	Extraction	Yes	Increased ingestion of carbohydrates	No		
**Alaska: general.....	Yes	Extraction	Yes	Lack of chewing; sweets, white man's food	Only children taught in school	Public Health Service Dental Surgeon, 1929, 1930	

2. THE MECHANISM OF PRODUCTION OF HYPOPLASIAS OF ENAMEL IN RATS AND SWINE ON EXPERIMENTAL DIETS[7]

Henry Klein, D.D.S., Sc.D., Department of Chemical Hygiene, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland

The production of hypoplasias of enamel in incisors of rats and swine on experimental diets appears to be dependent upon the fact that unbalances in the mineral composition of the diet produce changes in the papillary layer of the developing incisors. These changes are a proliferation of the cells of the papillary layer, and an increased secretion of a substance that penetrates between the ameloblasts causing a disruption of their structure and an ensuing loss of function, which results in a defect in the enamel deposition where the ameloblasts have been most affected by this process.

3. THE RELATION OF DIET TO THE TOXICITY OF VIOSTEROL AS A DETERMINING FACTOR IN THE PRODUCTION OF EXPERIMENTAL CARIES IN RATS[8]

Henry Klein, D.D.S., Sc.D., Department of Chemical Hygiene, School of Hygiene and Public Health, Johns Hopkins University, and David H. Shelling, B.S., M.D., Department of Pediatrics, Harriet Lane Home, Johns Hopkins Hospital, Baltimore, Maryland

(1) Rats fed diets *high* in calcium and *low* in phosphorus, plus large doses of viosterol (irradiated ergosterol), develop caries of the molar teeth. (2) Rats fed diets *low* in calcium and *high* in phosphorus, plus large doses of viosterol, *do not* develop caries of the molar teeth. (3) Rats fed diets *adequate* in calcium and phosphorus, plus large doses of viosterol, develop caries of the molar teeth. (4) Rats fed diets *adequate* in calcium and phosphorus, *without* viosterol, *do not* develop caries of the molar teeth.

[7] To be published in the *Journal of the American Dental Association.*
[8] To be published in the *Journal of Dental Research.*

4. CURVATURE AT CERVICAL THIRD IN HUMAN TEETH

Russell C. Wheeler, D.D.S., School of Dentistry, Washington University, St. Louis, Mo.

This paper is limited to one phase of normal tooth form only; namely, curvature at the cervical third of tooth crowns, labial or buccal, and lingual. I have been unable to come to any definite conclusion as to the extent of these curvatures in any given case. This is a study and not a conclusion. Apparently we find fairly uniform curvature here in all the upper teeth on both sides and on the buccal portion of lower posteriors. Since teeth photographed in their natural sizes are rather small, and engineer's graph-paper in squared millimeters is rather confusing because of the small squares, we photographed the teeth twice their natural size, which squared the dimensions, and placed cut-out photos of these enlargements on a background of squared millimeters. This paper is obtainable from an engineer's supply company. Therefore the slides are in correct and scientific proportions, demonstrating measurements of the teeth in millimeters, the outline of the tooth showing as a graph on the squared background.

Summary. The upper anterior teeth have greater curvatures on the labial than on the lingual. All upper anteriors have about the same curvatures. All upper posteriors have similar curvatures, and about the same curvatures buccally and lingually. Lower anterior teeth differ in that they have less curvature on either side. Lower posterior teeth have the same cervical curvature buccally as the upper anteriors and posteriors, but have greater curvatures on the lingual.

5. AN INVESTIGATION OF SPIROCHETOSIS OF THE DENTAL ANLAGE IN CONGENITAL SYPHILIS

Thomas J. Hill, D.D.S., Dental School and Institute of Pathology, Western Reserve University, Cleveland, Ohio

Nine suspected congenital syphilitic fetuses were examined in an effort to investigate spirochetosis as the direct cause of congenital syphilitic teeth. Specimens of the enamel organs and livers of each fetus were prepared according to the methods of Levaditi, Warthin-Stary, Jahnel, and Giemsa. Six fetuses were proven syphilitic by the

presence of spirochetae in the liver. The presence of Spirocheta pallida within the tooth germ was not demonstrable. The results indicate that there is insufficient evidence to justify the belief that congenital syphilitic dental deformities are the direct result of spirochetosis of the enamel organ.

6. A PRELIMINARY REPORT ON THE USE OF SODIUM PERBORATE IN DENTISTRY

F. J. Bacon, Ph.D., and H. C. Van Natta, D.D.S., Dental School, Western Reserve University, Cleveland, Ohio

Sodium perborate has been used as a general antiseptic since 1905, and in general dentistry as an antiseptic since 1906. It was first recommended in the treatment of Vincent's infection about 1910. The literature shows that the use of sodium perborate is due to the fact that, when the salt is dissolved in water, it reacts to form sodium metaborate and hydrogen peroxide. The hydrogen peroxide decomposes and liberates nascent oxygen. In order to determine the conditions under which sodium perborate liberates oxygen, various experiments were made. The salt used was sodium perborate, N. F. *V*, which assayed 9.856 per cent of available oxygen. For convenience, a saturated solution consisting of 0.4 gram of sodium perborate in 15 cc. of water (37°C.) was used as a basic formula. The oxygen released during the experiment was collected in a Lunge nitrometer, and converted to the percentage amount of available oxygen. The following results were obtained:

Sodium perborate, dissolved in warm water, yielded an average of 0.8 percent of available oxygen. The solution was alkaline. Sodium perborate, dissolved in warm water, and with the addition of potassium iodide, increased the yield to about 7.5 per cent of available oxygen. Saliva, added in small amounts to the solution of perborate and water, slightly increased the oxygen yield. By dissolving the sodium perborate in saliva alone, the yield was 4.5 per cent of available oxygen. The addition of potassium iodide in both cases gave nearly a 100-per cent yield of available oxygen. Sodium perborate, dissolved in warm water with the addition of whole human-blood, yielded 9.75 per cent of available oxygen, approximately 100 per cent of the available oxygen

of sodium perborate having been released. The use of $FeCl_3$, $MgCl_2$, KCl, NaCl, $CaCl_2$, KBr, and KH_2PO_4, as catalyzers, increased to only a very slight extent the yield of available oxygen.

7. A STUDY OF THE EXPOSED ENAMEL AREA OF THE DECIDUOUS AND PERMANENT TEETH

Joseph T. Cohen, D.D.S., Institute of Child Welfare, University of Minnesota, Minneapolis, Minn.

The purpose of the study was to determine the exposed amount of enamel of each of the teeth in a complete deciduous and a complete permanent dentition. The method of procedure was as follows: Impressions were taken in an adult having thirty-two (32) teeth in place and in good condition. Plaster casts were then made. This was also done in two five-year-old children having normal dentition. The individual teeth of the casts were separated, and gold caps burnished over each tooth down to the free gum-margin. Great care was necessary to eliminate any overlapping of the gold so that there would be but one thickness of gold covering the tooth. It was found that 24K gold plate 0.0605 mm. thick was best suited for this purpose. One ounce of such gold presents an area of 28,852.25 square mm. This divided by 480, the number of grains in an ounce, equals 60.108 square mm. in each grain of gold 0.0605 mm. thick. The enamel area of each tooth, therefore, could be computed by weighing each gold cap constructed.

The results indicate that there is very little difference in exposed enamel areas between the right and left sides of the mouth. The difference between the upper and lower teeth is less than 2 per cent. The complete set of permanent teeth have more than three times as much exposed enamel as the complete set of deciduous teeth. The twenty permanent teeth that replace the deciduous teeth have almost twice as much exposed enamel as the deciduous teeth. Not having been able to compare the deciduous and permanent teeth of the same mouths, these conclusions are not as definite as might be. However, the mouths used were typical, and at least the results show relative conditions.

8. INCIDENCE OF GINGIVITIS IN SICK CHILDREN

Joseph T. Cohen, D.D.S., Institute of Child Welfare, University of Minnesota, Minneapolis, Minn.

Some interesting data on the possible cause of gingivitis in children were secured by keeping an accurate record of mouth conditions of all children admitted to dentistry at the University of Minnesota Hospital. There were 296 sick children in this group, almost all of whom were bed patients. Of these children, 69, or about 23 per cent, had gingivitis. At a later examination of over 300 average healthy children, gingivitis was noted in less than 10 per cent. Therefore, inflammation of the gums might indicate a general systemic disturbance. Sixty-three (63), or about 20 per cent, were diabetics; and almost 15

TABLE 3

Frequency of gingivitis among sick children

MEDICAL DIAGNOSIS	APPROXIMATE PER CENT OF TOTAL NUMBER EXAMINED	NUMBER WITH NORMAL GUMS	NUMBER WITH GINGIVITIS	PER CENT WITH GINGIVITIS
Diabetics	20	54	9	14.75
Gastro-intestinal disturbances	15	22	16	42.10
Mastoid disease	5	13	3	18.75
Congenital luetics	5	12	3	20.00
Miscellaneous	55	126	38	23.17
Total	100	227	69	23.34*

* Average.

per cent had gingivitis. Diabetics, it would appear, have pathological gum conditions, but are less susceptible to gingivitis than other sick children. This fact is interesting, because diabetics are presumed to have poor gums. The children that had gastro-intestinal disturbances numbered 38, and composed about 15 per cent of all examined. Inflamed gum was more frequent in these children than in any other group. Gingivitis was present in 42 per cent of the mouths, which is about twice as frequent as in the average group of sick children. Congenital luetics, and children suffering from mastoid disease, each composed about 5 per cent of the group studied. Pathological gum conditions seemed to be present in their mouths about as frequently

as in the average sick child. The remainder, or about 55 per cent of the children, were placed in a group called "miscellaneous sick children." The frequency of gingivitis in this group was found to be about the same as in the average group of sick children. *Conclusions (Table 3):*

(1) Children with gastro-intestinal disturbances showed inflamed gums in almost 50 per cent of the cases. This condition of the gums is found about twice as frequently in this group as in any other of sick children. (2) Diabetics had more gingivitis than healthy children, but less than the average sick child. (3) Inflamed gums were found more frequently in sick children than in well children. Therefore, if gingivitis is present in a child's mouth, the general physical condition of that child should be thoroughly examined to find if possible the cause for the mouth condition.

9. ERUPTION OF TEETH IN SUBNORMAL CHILDREN

Joseph T. Cohen, D.D.S., Institute of Child Welfare, University of Minnesota, Minneapolis, Minn.

In this study we examined the 218 physically well children, between the ages of 5 and 15 years, at the State School for the Feeble Minded. A comparison of this group with a group of Minneapolis school children was made. The upper lateral incisor was missing four to five times as frequently, and the lower from twelve to fourteen times as frequently, in the subnormal group as in the group of normal children. *Conclusions:* (1) Defective children have fewer permanent teeth at any age than do normal children. (2) The permanent lateral, especially the lower, is more often congenitally missing in defective children than in normal ones. (3) Among children with congenitally missing laterals, the remaining teeth erupt later in defective children than in normal ones.

10. CAUSES OF DYSTROPHIC ENAMEL FORMATION

Joseph T. Cohen, D.D.S., Henry Bjorndahl, D.D.S., and H. B. Ruettell, D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

A number of writers have stated that defective enamel formations, such as grooves and pits in the labial or buccal and lingual surfaces of

the permanent teeth, are caused by various childhood diseases. They do not include the so-called mottled enamel, which is supposed to be caused by certain types of drinking water. Therefore we do not include that type of enamel defect in our study. We seek to determine, if possible, the relationship of various childhood diseases to dystrophic enamel; which have the worst effect on enamel; and the age at which enamel is most likely to be affected. It is entirely possible, of course, that dystrophies of enamel are due to some other cause than childhood diseases. In this study we use average normal school children from age 7 to 12. The enamel of the permanent teeth is carefully examined for any defect. The past history, such as type and severity of disease, and age at which the child contracted it, is obtained from the parent. Where definite and accurate information cannot be obtained, the record is discarded. The available results are not yet definite in their indications. The study is in progress.

11. HISTOLOGIC CHANGES OF BLOOD CELLS IN DENTAL DISEASE

Irwin A. Epstein, D.D.S., Dental Division, University Hospital, and College of Dentistry, University of Minnesota, Minneapolis, Minn.

It has been aptly stated by Piney that "the size of a blood count is not a feature of a blood examination on which most stress is to be laid, just as the size of a tumor can give little information as to its nature. The one method of real value must depend upon detailed examination of the constituent cells. This is generally admitted in regard to neoplasms." This method necessarily forms the basis for accurate interpretation of hematologic findings, and includes a knowledge of the origin and development of the blood cells. Under normal conditions only adult forms are found in the blood stream, and the morphologic variations are somewhat limited. Changes in the morphology of the cells are due either to immaturity (the presence of the younger forms as they appear during the various stages of maturation), to increased functional activity, or to direct action of toxins on mature cells in the circulating blood. The following is a brief summary of the histologic changes in blood cells, as noted in a study of persons having dental disease.

One-thousand-cell studies of leucocytes were made from each of 100 cases with dental infection, before and after treatment. Special emphasis was placed upon the alterations in the histology of the cells. All studies were made from smears by the cover slip method, and stained with Wright's stain (Grübler's). The most constant deviations from normal-blood values were found in the qualitative or histologic study of the cells. Anisocytosis (variation in the size of the red cells), hypochromasia (a paleness due to diminution in the amount of hemoglobin), and polychromatophilia (slight amount of blue spongioplasm indicating immaturity) were the most common alterations of the red cells. These cytologic evidences of secondary anemia were found in only a few cases. The alterations in the leucocytes occurred with more regularity, although no consistent co-relation could be worked out between the extent of the blood alterations and the clinical dental findings. The observed morphologic features of the leucocytes were these: (1) Nuclear analysis: The nuclear pattern is important and determined by total amount of chromatin, relative amount as compared with parachromatin, arrangement and staining reaction of the chromatin and parachromatin, outline of the nuclear membrane, and size of the nucleus. (2) The cytoplasm was examined for staining reaction, presence of vacuoles, presence or absence of granules, character of granules when present, i.e., shape, staining reaction, size, and number and distribution. (3) Position of nucleus in the cell. (4) Relative size of nucleus to cytoplasm. (5) Relative sizes of cells.

The cells themselves exhibit evidences of (1) increased functional activity (increase in cytoplasm, appearance of vacuoles, increase in nuclear lobulation); (2) normal regeneration (immaturity); (3) pathologic regeneration (cell structure indicating misdirected development), and (4) degeneration (coalescing of the chromatin network in the nucleus, causing a blurring of the nuclear pattern; fusion of nuclear segments; pyknosis of the nucleus; development of granule-free spaces; alteration of size, shape, number, staining reaction and distribution of granules; alteration in size, and shape of cells; change of position of the nucleus in the cytoplasm; fragmentation of cells). Qualitative analysis of the histology of the blood cells showed an increase in the number of band, toxic and fragile neutrophils, leucocytoid lymphocytes, and young, toxic and lobulated monocytes, frequently

in the presence of undisturbed differential counts. The group tendency is a rise in the hemoglobin and red-cell counts; whereas the leucocyte counts rise in some cases and fall in others toward an average figure. However, all cases do not show uniform improvement of the counts. There was general improvement in the histology of the cells following the eradication of dental infection, although in a small percentage of cases this was not the case. No consistent co-relation could be worked out between the cytologic changes and the clinical dental findings. The observed alterations cannot be regarded either as pathognomonic or specific, for they are like those found in other infectious processes, varying only in degree.

12. THE VALUE OF THE DENTINOCEMENTAL JUNCTION IN PULP CANAL SURGERY

Carl J. Grove, Ph.G., D.D.S., St. Paul, Minn.

The late G. V. Black defined cementum as being a specialized tissue. A structure possessing special characteristics has specific functions to perform. Inasmuch as there is very good reason to believe that cementum is impervious, it is obvious that one of its functions is to protect the investing tissues against the invasion of bacteria from the dentin. The dentinocemental junction is therefore of value in pulp-canal surgery because it offers an ideal point for the termination of the canal filling. In other words, sealing the canal at this position, assures closing the foramen in the cementum, which insures a complete impervious covering of the dentin. Whereas, if the filling terminates in the dentin or short of the dentinocemental junction, a precarious situation is created, because it makes the escape of bacteria to the periapical tissue possible. Periapical infection is invariably due to organisms escaping from the dentin, by way of the canals. If cementum were permeable, infection would frequently occur on the sides of the root also. It is obvious that when the filling fails to reach the junction, a continuous migration of bacteria to the apical tissue occurs, thus making healing impossible. A more favorable environment for the production and continuance of periapical infection cannot be conceived.

Sealing the canal at the proper apical position is one of the essentials

in successful pulp-canal surgery. To accomplish such results, the filling should not terminate short of the dentinocemental junction. When referring to the junction I do not mean the deposit of cementum formed inside the apical portion of the pulp canal, so frequently found in teeth at middle life or advanced age. In previous writings I have stated that the filling should not terminate short of the junction of primary dentin and the primary cementum. There can be no objection to the filling extending into the primary cementum, but there are serious objections to its terminating in the dentin. For nearly two decades I have emphasized the important part cementum plays in the healing of periapical tissue, following pulp removal, as well as in the development of the root-end of teeth with vital pulps. In the issue of *Dental Cosmos* for July, 1916, I offered an explanation of the origin of multicanals, showing that the foramina were formed by cementum. I also published a method of preparing extracted teeth to disclose the canals. Photographs of these specimens have been published at various times. A careful study of these teeth revealed the fact that a large percentage of roots have multicanals making apical cementum permeable. During the process of root-end development these canals are formed as a result of the deposit of calcic material in the replacement of the tissue in the divergent foramen. As I have explained in previous articles, cementum is gradually laid down as the obliteration of the soft tissue occurs, but the blood vessels remain intact and calcic materials are formed around them, leaving openings to the pulp tissue for the maintenance of nutrition.

The directions of the accessory canals are not in a line with the long axis of the root, but pass diagonally through the apical cementum until they enter the pulp canal, where they group into a bundle, so to speak, upon reaching the dentin. The tissue in the multicanals formed by cementum consists largely of blood vessels. But at the foramina, periodontal membrane exists. This structure has a most important part in producing and maintaining a healthy condition of the periapical tissue of pulpless teeth. It is only by hermetically sealing the apical openings in the primary cementum that the membrane can be induced to function in bringing about these results. Obviously the apical cementum is permeable in a large percentage of teeth owing to multicanals. Some may be of the opinion that sealing

the apex is impossible because of this condition, but such is not the case. When the diameter of the canal is sufficiently enlarged and extended to the primary cementum, the openings that may exist in the dentin are thus obliterated, and sealing the pulp canal at this point removes the possibility of bacteria escaping from the dentin to the periapical tissue. I believe that if it were not for the activity of the cementoblasts, pulp-canal surgery could not be successful. This belief is based upon studies of cementum, which have been published at various times. In a paper read in December 1919 (*Journal of the National Dental Association*, 1920, Sept.) I published a photomicrograph showing the development and attachment of new periodontal membrane on a resected root of a dog, and a section showing a deposit of cementum on the inside of the apical portion of a pulp canal. In the issue of the same *Journal* for October, 1921, there appears a photomicrograph of a section of a root showing that cementum had formed across the broken surface. In the issue of the same *Journal* for February, 1921, I also showed that new cementum had closed the foramen. These facts, with many others that have appeared in the dental literature, demonstrate that the cementoblasts are of biological significance in the repair of all forms of periapical injury. When these facts become recognized by the profession, pulp-canal surgery will take its place as an important branch of dentistry.

13. PATHOLOGIC CHANGES IN EXPOSED ALVEOLAR BONE

W. R. Schram, D.D.S., M.S.D., St. Paul, Minn.

In securing material for a histologic study of bone repair after tooth removal, interesting information was obtained through an error in technique, which was followed by faulty healing. Sutures were prematurely lost in a surgical-removal wound, and at 42 days, when the tissue was removed for sectioning, it was found that the bucco-mucoperiosteal flap had sagged away from the socket. A clot had not formed and the epithelium, instead of growing across the socket, grew down, lining the flap, leaving the bone exposed to the fluids of the mouth. We obtained, thereby, a section showing the progress of bone pathology and repair in the same tissue. Epithelium had grown down, completely lining the soft tissue flap and covering the soft tissue overlying the bone of the lingual side. In the body of the wound

there was a great deal of debris, and many small spicules of dead bone were being cast off as sequestra. Where living bone had been exposed, evidence of definite bone-degeneration was apparent. In many areas, where bone destruction had evidently taken place previously, there was filling-in with connective tissue, active reorganization of soft tissue, and evidence of new bone being laid down along the margins of the adjoining old bone.

III. Second Session: Afternoon, March 21; Abstracts 14–20

14. PHYSIOLOGIC CHANGES IN THE DENTIN[9]

Theodore B. Beust, M.D., D.D.S., F.A.C.D., School of Dentistry, University of Louisville, Louisville, Ky.

This contribution incorporates synopses of three papers. The first was presented at the annual meeting of the American Dental Association, at Denver, in July, 1930. One was read before the Chicago Section of the International Association for Dental Research, on February 1, 1931, and the last at the annual meeting of the Chicago Dental Society, on February 4, 1931. The work deals with certain reactions occurring within the dentinal tubules. These result from biologic stimuli, such as stress and thermal changes; also from irritations resulting from abrasions or caries, and from reactions following the physiologic obliteration of the pulp cavity through calcific deposition. Any of the stimuli mentioned may cause a sclerosis, characterized by partial or complete obliteration of the tubules affected. The sclerosis has been divided into two forms, one exhibiting a preponderance of transparent dentin; another, a preponderance of opaque dentin. It is suggested that the presence of such altered tissue is related to the increase of resistance to caries that is evident in late maturity.

15. RESISTANCE TO CARIES[10]

Theodore B. Beust, M.D., D.D.S., F.A.C.D., School of Dentistry, University of Louisville, Louisville, Ky.

In this paper caries-resistance is divided into serologic resistance—active in early life, depending on the quality of the secretions—and a

[9] Published in the preceding issue (April): *Journal of Dental Research*, 1931, xi, p. 267.
[10] To be published in the *Journal of Dental Research*.

structural resistance—active in later life, depending on physical constitution of tooth substance. Factors apparently contributing to the state of relative resistance that occurs after maturity are progressive sclerosis of the enamel lamellae and tuft systems, and progressive sclerosis of the dentinal ground substance and fibrils. Alcoholic anilin stains were used to demonstrate the presence or absence of sclerosed tissue. In a study of seventy functionally intact, unselected teeth, 38 per cent exhibited sclerosis of over one-half of the anatomical crown; 35 per cent exhibited sclerosis of from one-fourth to one-half of the anatomical crown; 18 per cent displayed only slight macroscopic evidences of crown sclerosis; while 7 per cent showed no appreciable macroscopic evidences of sclerosis. The writer claims that a tooth's resistance to caries, or other tooth-destroying reagents, increases in proportion to the amount of its sclerosis.

16. THE SOLUBILITY OF DENTAL ENAMEL IN VARIOUS BUFFERED SOLUTIONS[11]

F. F. Kanthak and H. C. Benedict, M.S., Chemistry Department, Dental School, Northwestern University, Chicago, Illinois

As dental caries may be due to a dissolution of inorganic constituents of enamel, the solubility of the salts contained in enamel is a study of great importance. Most of the articles on various phases of this subject are practically worthless because of the omission of various necessary precautions and controls, or because no consideration has been given to certain factors that would affect the results and hence the conclusions. We have attempted to eliminate these sources of error. The factors we considered essential to ascertain or control were these: (1) pH; use of buffered solutions. (2) Area of the enamel exposed to the solution; use of powdered enamel. (3) Time of reaction; greatly reduced by using enamel powder. (4) Uniform conditions of solution; by a similar shaking of each mixture. (5) Calcium or phosphorus ions; already present in the solution. (6) Dryness of enamel; dried at a pressure of about 1 mm. at the boiling point of butyl alcohol (117°C.) for six hours.

A weighed sample of enamel powder was shaken for a given time,

[11] To be published in the *Journal of Biological Chemistry*.

in a shaking apparatus, with a known volume of a buffer solution the composition of which had been determined. The solution was promptly filtered and analyzed for calcium and phosphorus. To avoid the presence of phosphate ions in buffers around the neutral point, a new maleate buffer was devised which will be described elsewhere. From our results, the following conclusions may be drawn.

(1) Powdered enamel is dissolved at the rate of about 0.82 per cent in the first hour, at a pH of 7.8; in distilled water, at about 0.57 per cent in the first hour. (2) This rate increases with decrease in pH. (3) The rate of solution decreases with time, as the system approaches equilibrium. (4) The presence of calcium or phosphate ions, or both, appreciably reduces the solubility, i.e., in Sörensen's phosphate-buffer at a pH of 6.6, there was no decalcification. (5) The solubility of dental enamel approximates the theoretical solubility product for tri-calcium phosphate. (6) Teeth are prevented from dissolving in saliva because of the calcium and phosphate present.

17. AGE-CHANGES IN INORGANIC CONSTITUENTS OF SOUND HUMAN TEETH

Helen M. Lundstrom, M.S., and Samuel E. Pond, Ph.D., Medical School, University of Pennsylvania, Philadelphia, Pa.

The authors reported chemical analyses of whole teeth. Selected portions of the data, when arranged with reference to increasing age, indicate that the inorganic composition changes more with respect to magnesium and carbonate than to calcium and phosphate. The composition differs from age to age more than has been previously recognized. With reference to the percentage composition of dry, fat-free unashed teeth, an increase of 50 per cent in magnesium and a decrease of 20 per cent or more in carbonate, has been shown. The ratios Ca: Mg were decreased between the ages of 12 and 62, while the ratios PO_4:CO_3 increased. Thus far studies have been chiefly confined to mandibular incisors from individuals who have not suffered from oral, endocrine, or bone diseases; mostly from accident cases, or from subjects of surgical operations. No attempt was made to remove enamel from the teeth in these preliminary studies. The work is being continued with a larger number of teeth to determine the variations among different individuals of about the same age.

18. NATURE OF THE TOOTH-PHOSPHATES

Samuel E. Pond, Ph.D., Medical School, University of Pennsylvania, Philadelphia, Pa.

Data from several sources have been studied with reference to the calcium phosphates that comprise the larger portion of the inorganic tooth-solid. No attempt was made to differentiate between the several calcium salts. The values of $\frac{P_2O_5}{CaO}$ ratios (calculated from quantitative chemical data) have been taken to indicate the general type of mixture. Data calculated from Kühn's analyses indicate that enamel undergoes changes that are different from those in dentin. The enamel phosphates were more basic with advancing age, while in dentin they were more acidic. In other words, in teeth from older people, the calcium phosphates of enamel consisted of a larger portion of the more basic salts; while those found in dentin were of the more acid salts. It is presumed that the salt mixtures in enamel may be expressed as $CaHPO_4 < Ca_3(PO_4)_2 < Ca_9P_6O_{24} \cdot Ca(OH)_2$; and in dentin, $CaHPO_4 > Ca_3(PO_4)_2 > Ca_9P_6O_{24} \cdot Ca(OH)_2$. The existence of but a single compound seems to be precluded by the data. The literature indicates slight differences between individual teeth such as canines, molars, etc., of the same individual, although the third molar in Gassmann's analyses appears to have an exceptional composition.

When data concerning whole teeth, as secured by Miss Lundstrom, were compared with data from other sources, it was found that the changes with respect to age were relatively slight, presumably because both enamel and dentin were included. The effect of the former may offset the effect of the latter in the calculated values (e.g., $\frac{P_2O_5}{CaO}$). The data have been compared with values for bones. Changes in dentin, between ages 12 and 60, were found to be opposite to those in whole skeletons and individual bones, while the alterations in enamel were similar to those in bones. For whole teeth, Lundstrom found values higher than those previously reported. Her method of preparing teeth for analysis is the same as ours for bones, including steps that avoid hydrolysis of the phosphates. These presumably account for the relatively higher values of $\frac{P_2O_5}{CaO}$.

19. METHODS AND CRITERIA IN AN ELEMENTARY COMPARATIVE STUDY OF THE SOLID-PHASE OF TEETH AND BONES

Samuel E. Pond, Ph.D., Medical School, University of Pennsylvania, Philadelphia, Pa.

A review of the methods employed in studies of the composition of teeth and bones has revealed several sources of error, which have been overcome. Preliminary treatment of dried, unashed material, by washing in ordinary distilled water or boiling water (primarily to remove salts assumed to have come from the bone-fluid or tooth-fluid), is considered a source of significant error. The hydrolysis of the phosphate, $Ca_3(PO_4)_2$, in aqueous solutions, was demonstrated by Warrington. It occurred with crushed and powdered teeth when treated repeatedly with water (which had not been made CO_2-free), but not when treatment with water was avoided. Teeth and bones treated with small volumes of CO_2-free, dilute formaldehyde, neutralized before use by $Ba(OH)_2$ and followed by extraction of the crushed structures with hot alcohol, were found to be suitably prepared for quantitative analysis of the inorganic constituents, without loss or change of these ingredients. A special arrangement of analytical procedures with empirical standardization of each step has reduced significant errors, the magnitudes of which at present do not affect data previously presented and serve as a basis for determining age-changes in whole teeth. The analyses of teeth, bones, and homologous tissues have been made by these procedures, serially, on one and the same sample of 50 to 100 milligrams of dry, fat-free material. Data from analyses have been used for the determination of certain constants and variations, considered as criteria in the changing composition of the tooth-solid. They have also brought to light, in teeth, changes different from those in bones. It is considered that these criteria may be used in further studies of dentin, enamel, and alveolar bone.

Differences among the analytic data secured by a selected group of investigators are pointed out. Discrepancies between these results appear to be caused chiefly when indirect methods are used, such as for fluorine, chlorine, and carbon dioxide. It is presumed that the age of the subject, and faulty analytical criteria, have combined to cause rather large errors in the data of others, but which cannot be

easily explained. Further studies will be necessary to avoid errors in determining the more detailed composition of sound dentin, enamel, etc. This work is in progress.

20. ADAMANTINOMA: A STUDY OF TEN CASES

C. W. Waldron, D.D.S., M.D., F.A.C.D., and H. G. Worman, D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

Tooth development is a progressive process, with corresponding changes in the soft tissues concerned. We believe that the histologic structure of an early adamantinoma corresponds definitely to that stage of tooth development in which the growth began, rather than to any particular *point of origin.* Also, we believe that long-continued adamantinomas are likely to become cystic, and apt to show areas of degeneration. We further believe that the *specialization of the oral epithelium occurs in the normal cells*, i.e., after aberration has started, the tumor cells tend to maintain a type corresponding to the stage of tooth development (stage of differentiation of enamel epithelium) at which the tumor began its growth. Specialization continues in the tumor only within very narrow limits if at all.

IV. THIRD SESSION: EVENING, MARCH 21; ABSTRACTS 21–27

21. CLINICAL MANIFESTATIONS OF FUSOSPIROCHETAL INFECTIONS

R. D. Dean, B. S. Eng., D.D.S., M.D., Department of Pathology and Surgery, Dental School, University of Tennessee, Memphis, Tenn.

The clinical manifestations of fusospirochetosis may be local or general, acute or subacute, or chronic. The lesions occur in the mouth, fauces, tonsils, pharynx, lungs, middle ear, and mastoids; also in the gastro-intestinal tract, genitalia, and in ulcers about the body. The most frequent site of infection is in the oral cavity. Here it occurs under gum flaps, in crevices, in sub-gingival spaces, and in pyorrheal pockets where partial anaerobiosis is maintained. In the severely acute type, known as ulcerative stomatitis or trench mouth, the gums are swollen, edematous, ulcerated, and markedly inflamed. There occurs over the gum tissues, and about the necks of the teeth, a thin pseudo-membrane varying in color from ashen grey to yellowish white, and

usually blood-tinged. Small yellowish-white areas are frequently seen beneath the membrane, which give it a speckled appearance. These are areas of necrosis and collections of exudate, composed of white cells, microörganisms, and the mycelia, a part of the normal cycle of the Bacillus fusiformis. The mycelia constitute a network of fibers and make up the bulk of the pseudomembrane. They contain within their meshes the fusiform in all phases of its development, Vincent's spirals and other organisms, blood corpuscles, epithelial and pus cells, serum, and fibrin all matted together with food particles, debris, and ropy mucilagenous saliva. The thin membrane is easily removed, revealing a very red gum tissue with an "angry" look owing to inflammation, a pigment derivative of haemoglobin, and gangrene. The gum tissue is succulent, owing to a great increase of interstitial tissue fluid, and contains large numbers of microörganisms in the tissue spaces and lymph channels, and in and around the capillary loops, thus producing thrombi and wedge-shaped infarctions. Frequently there occur large ulcers in the mouth, with irregular ragged borders and necrotic centers. There may be wide-spread gangrene and necrosis of the oral tissues and jaws. The most severe acute types occur in children as noma, which is gangrene of the periodontal, labial and buccal tissues, and is usually fatal. The acute symptoms may subside and then recur, thus giving the subacute clinical manifestations. All the symptoms may be greatly reduced and thus become chronic, or a chronic case may have a slow insidious onset, and present slight clinical manifestations. This variation in the severity of the symptoms is no doubt due to the relative amounts of lysins, opsonins, and certain antibody protections. We have now in progress investigations on the oxidases of the oral tissues and fluids, which seem to play an important rôle in immunity against this infection. Frequently an involvement of the salivary glands produces a profuse, ropy saliva; also of the glands of the neck with a cervical adenitis; and in the tissues on the floor of the mouth there is a board-like rigidity simulating Ludwig's angina.

The general or systemic manifestations vary much as to type, extent, and severity. There are frequently malaise, weakness, intestinal upsets, insomnia, headache, and nervous manifestations. Usually there is some decrease in the granulocytes, and a relative increase in the

lymphocytes. There may exist anemia, leucopenia due to loss of granulocytes, relative lymphocytosis with accompanying anisocytosis, poikilocytosis, and polychromatophilia—an associated blood dyscrasia due to a fusospirochetal blood-stream infection, perhaps a filterable phase. The investigations of the clinical manifestations of fusospirochetal infection in both man and laboratory animals were illustrated by a series of slides. This infection has been observed in various parts of the human body, such as the nose, sinuses, middle ear, mastoid, fauces, tonsils, pharynx, lungs, and genitalia. The fusiform organism was cultured from the blood stream of a case of fusospirochetal stomatitis associated with a blood dyscrasia. The nature of the cultural methods used to obtain this positive blood-culture indicated that the blood stream may become infected with a filterable phase, and that some relationship exists between such an invasion and certain blood dyscrasias such as the anemias and leukemias. The pseudomembrane, with its accompanying lesions, was produced in laboratory animals by inoculation with fusiform organisms. This organism was recovered from the lesions, and from the blood of the inoculated animals, and grown in pure culture.[12]

22. CULTURAL OBSERVATIONS ON FUSOSPIROCHETAL INFECTIONS[12]

Marguerite T. Dean, B.S., M.D., Dental School, University of Tennessee, Memphis, Tenn.

Much diversity of opinion exists relative to the cultural characteristics of the fusospirochetal organisms so constantly found associated in lesions of the oral cavity. All investigators agree upon the marked pleomorphism exhibited by the bacillus, but whether the spirochete is a separate and distinct organism, or a phase of the bacillus, is still an open question. The present paper is a preliminary report of cultural studies of fusospirochetal infections. A correlation between the findings in the test tube, and in smears from the exudate, was drawn. Strains were isolated from mixed cultures of exudate from oral lesions and from the blood stream. A series of slides illustrated these observations and also demonstrated that the various phases found in smears from exudate are also present in smears from pure cultures.

A probable life-cycle of a microscopic plant that yields fusiform

[12] To be published in the *Journal of Dental Research.*

bacilli was described. Studies of the strain isolated from the blood stream indicated a filterable phase that developed and yielded fusiform bacilli in optimum cultural environment. Strict anaerobic conditions and the presence of some body fluid, while they enhanced the development of the complete cycle, were not required, but the cycle evolved in fresh veal-infusion brain-broth without any special anaerobic conditions. The cycle could be arrested in some of the early phases by an unfavorable environment, and repeated generations of the adjusted phase were obtained. Further studies of the motility of various phases are now in progress, but from observations already made, the vibrio forms appear to have flagella and are actively motile; the young fusiform bacilli are motile, but when fully developed lose their motility, are unstable, and soon disintegrate; and the germinating spores in the early stages of development may be motile and mistaken for motile spirochetes, but this observation has not been definitely established.

23. A NEW CONCEPT OF ENAMEL HISTOGENESIS[12]

Henry Klein, D.D.S., Sc.D., Department of Chemical Hygiene, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Md.

A study of sections of parathyroidectomized rats on diets low in calcium and high in phosphorus warrants the suggestion that the cells of the papillary layer play a rôle in producing the enameloid (enamel matrix, interprismatic substance), and that the ameloblasts determine the calcification of this matrix through depositions of calcospherites.

24. PHYSICO-CHEMICAL STUDIES ON THE STRUCTURE OF DENTAL ENAMEL. VI. DETERMINATION OF THE ISOELECTRIC POINT[13]

Henry Klein, D.D.S., Sc.D., Department of Chemical Hygiene, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Md.

Determinations of membrane potential across the enamel of dog canines, using acetate buffers and maintaining the same concentration

[13] To be published in the *Journal of Dental Research.*

gradient in each buffer, show that the isoelectric point of the enamel lies between pH 4.31 and 4.35.

25. VALUE OF SEDIMENTATION TESTS IN DIAGNOSIS OF PERIAPICAL INFECTION[14]

Thomas J. Cook, D.D.S., Dental School, University of Pennsylvania, Philadelphia, Pa.

This study was undertaken to determine whether the presence of periapical infection would influence the rate of sedimentation of erythrocytes. The dog was used as the experimental animal because (a) chronic dental infection can be successfully produced; (b) other foci which might influence the study are absent; and (c) the animal may be readily controlled as to diet, exercise, etc. Thirty dogs were used: five in which experimental tuberculosis had been produced; five that were pregnant; ten in which chronic dental infection had been produced; and ten that were normally healthy. Four cc. of blood were added to a graduated tube that contained 1.5 cc. of 1.6 per cent sodium citrate solution, which was kept at constant temperature. Readings were made every ten minutes for the first two hours, and then every hour for the next six hours. In the first series, that is the five tubercular and the five pregnant dogs, the rate of sedimentation was rapid, while the rate of sedimentation for the ten dogs that had chronic dental infection was the same as that for the ten normal healthy dogs.

26. DENTAL AND DIETARY STUDIES AMONG ABORIGINAL TRIBES OF THE TIBETAN BORDERLAND

R. Gordon Agnew, B.A., L.D.S., D.D.S., and Mary Caldwell Agnew, B.A., College of Medicine and Dentistry, West China Union University, Chengtu, Szechwan, China

On account of the unusual environment, habits of living, diet and racial characteristics of the aboriginal peoples living in the borderland region between Tibet and West China, it was felt that investigation

[14] Work done at the Mayo Foundation, Rochester, Minn. To be published in the *Journal of the American Dental Association.*

of oral conditions and of the diet of these people would be of value. This preliminary study was limited largely to the "Chiang" tribes-people. These mountain dwellers eke out a harsh living from scanty and unproductive mountainside cultivation; engage in some sheep-raising, hunting, and collecting of medicinal herbs. Timidity and superstition limited the scope and amount of examinations made. For racial comparisons individuals of Chinese origin living in the same environment have been included. The total incidence of caries was found to be 37.2 per cent, with an average of 2.55 cavities per carious mouth; in all adults, 38.9 per cent; in all children, 35.1 per cent (average of 2.57 cavities per carious mouth in children). Incidence in all tribes-people, 35.8 per cent (adults, 37.1 per cent; children, 32.5 per cent); in all Chinese, 43.2 per cent (adults, 42.3 per cent; children, 45.4 per cent). As to frequency of involvement of the various permanent teeth, the first molar was most affected, having 31.10 per cent of all cavities; third molar, 28.76 per cent; second molar, 25.93 per cent; second bicuspid, 4.70 per cent, etc. Among the temporary teeth, again the first molar led with 44.72 per cent; second molar, 23.67 per cent; central incisor, 15.78 per cent; lateral, 13.15 per cent; cuspid, 2.63 per cent. Periodontal disease in some form, varying from mild gingivitis to deep seated lesions, was practically universal. As to oral hygiene, very bad conditions were found: 90.6 per cent of mouths were classified as dirty or extremely dirty. Comparison is made with figures obtained in a previous survey among the Chinese in the populous city of Chengtu (capital of Szechwan Province). The general incidence of caries in adults is similar, 42.6 per cent, but in children, 69.5 per cent. An estimation of differences in environment between the two groups of children must include the fact that the use of sweets in various forms is becoming increasingly prevalent in the large cities, but is almost unknown among these aborigines. Incidence of periodontal disease is similar in both districts.

The basis of the diet is yellow corn. The whole kernel is used, supplemented by a small quantity of vegetables. The vegetables most commonly used are "lian hua be" and "be ts'ai" (two varieties of cabbage), "ch'in ts'ai" (a vegetable similar to lettuce), cucumbers, peppers, leeks, string beans, yellow beans, horse beans, and potatoes.

Meat is very little used, except on special occasions, feasts, etc. It is difficult to procure it fresh. Oils are little used: "ch'in iu" (a vegetable oil) and sesame oil are the commonest. Flavorings are little used. Fruits are scarce and poor. "Hua hong" (a very small apple), plums, and dates are the chief fruits available. In winter, salted vegetables are used; potatoes form an auxiliary, not a basal food. *Estimation of the diet. Total calories*: Using Western standards of basal metabolism, the diets are perhaps adequate in this respect. There is no excess; many cases are on the borderline, or slightly under normal requirement. *Protein* is slightly in advance of some of our standards. However, the coefficient of digestibility of animal proteins is 97 per cent; of cereals, 85 per cent; of dried legumes, only 78 per cent when in a mixed diet. When cereals and legumes form the bulk of the diet, the coefficient is apt to be even lower. Regarding the quality of proteins, those of yellow corn are glutelin (a complete protein) and zein (lacking tryptophane and lysine). However, the corn is supplemented by small amounts of soy bean and vegetable proteins, which probably make the diet adequate in this regard. The diet seems adequate in *mineral content*, phosphorus and calcium being much above our standards; iron is on the borderline. There seems to be a decided lack of *vitamin A*. This is interesting in view of the prevalence of eye disease. *Vitamin B* complex, *vitamin C*, and *vitamin E* are in abundance, *Vitamin D* seems markedly deficient; but since these people spend much time in the open air, they get an abundance of sunshine.

27. ROOT CANAL EQUIPMENT CLASSIFIED AND STANDARDIZED

A. E. Webster, D.D.S., M.D., M.D.S., F.A.C.D., Dental Faculty, University of Toronto, Toronto, Canada

The author has attempted to classify root-canal instruments as was done by Black with dental cutting-instruments. The handles are all the same size and length and so are the shanks. The working points are the same length, but of three sizes. The idea is to standardize the instruments used for the same purpose. A device for measuring the length of roots of teeth was shown attached to the broaches. The measuring device was devised by Dr. Kreuger.

V. Fourth Session: Morning, March 22; Abstracts 28–35

28. Influence of Variations in Manipulation upon Volume Change and Strength of Amalgam[15]

Marcus L. Ward, D.D.S., D.D.Sc., F.A.C.D., and Erman O. Scott, D.D.S., Dental School, University of Michigan, Ann Arbor, Mich.

One of the first things we attempted to do was to decide upon what basis one should determine what constituted a normal mix of alloy and mercury. From a review of the literature, it appeared that three minutes had been a quite generally accepted time to mix the alloy and mercury. The literature showed that little attention had been given to the type of mortar used, the speed with which the pestle was revolved in the mortar, the pressure of the pestle upon the alloy, and the time of mulling in the hand. It also showed that packing pressure up to 10 pounds (3650 pounds per square inch) on a 1.5 mm. circular flat-faced plugger would probably increase shrinkage with certain alloys, but it had not been proven that this would be true with all alloys under these conditions. It was quite evident that three minutes, or any other given time, was a more or less meaningless measure of work accomplished, and consequently of the physical constitution of the mass. With these things in view, we attempted to decide what should constitute a normal mix of alloy and mercury, and also what constituted an under-mix, and what an over-mix. We first decided what should constitute a normal mix with each of five products chosen for this study. Inasmuch as no standard apparently has ever been set for the normal mix, and inasmuch as it appeared, from previous work on the subject, that the mix that produced the greatest strength was likely to produce shrinkage, it was decided to approach the problem in another way. With each of the five alloys chosen for our study, therefore, we determined what physical constitution of the mass was most suitable to make a tight plug. We assumed that unless the tight plug were made first, volume change and strength were relatively unimportant. On the other hand, we assumed that after a tight plug had been made, it was highly desirable that the volume change be

[15] To be published in the *Journal of Dental Research.*

developed to a minimum and the strength to its highest degree. With the normal mix, the under-mix, and the over-mix determined, upon the basis of physical constitution of the mass, we then proceeded to test volume change and strength. It was found, as we had supposed, that within certain limits crushing resistance increased with the work done on the alloy, and that flow increased with either the under-mix or the over-mix. We also found that under-mixing (packing pressure included) tended to produce expansion, and over-mixing tended to produce shrinkage, especially if the alloys were close to the zero point. If, however, the setting-change range were well above the zero point, these tendencies were less pronounced, and in no case have we been able to place these latter alloys in the rejectable class on account of shrinkage produced by over-working.

We found that increasing the packing pressure up to approximately 5250 pounds per square inch lessened expansion with alloys which expanded, and increased shrinkage with those which shrank. Between approximately 5250 pounds per square inch, and approximately 21,000 pounds per square inch, there appeared to be no marked effect by increasing packing pressure, but beyond this amount, up to approximately 227,500 pounds per square inch (the highest we have applied), there was no initial shrinkage and an expansion of 8 microns per cm. during the first twenty-four hours. A considerable significance, from a theoretical standpoint, may be attached to this reversal of the setting-change curve.

Our conclusions include the following:

(1) The specifications which provide that an alloy shall be regarded acceptable if it shows a final setting change of from 1 to 10 microns should be raised above the zero point not less than 3 microns. (2) The manufacturers should be required to state in the directions for the use of their alloy the conditions under which a mass may be rendered suitable for making:

(a) A tightly packed plug (filling)

(b) A filling with desirable volume change

(c) A filling with good strength but not necessarily the greatest

(3) They should cease advertising upon the basis of one property of their products when it may be shown that the development of this property has been to the detriment of other properties to such an

extent as to cause the alloy to be rejected. (4) The directions for the use of these products should include the following, in order that a different manipulation will not cause those who do testing work to place them in the rejectable class, and also to prevent disappointment for practitioners:

(a) Type of mortar and pestle
(b) Roughness of the mortar and pestle
(c) Pressure of the pestle upon the alloy in the mortar
(d) Speed of the pestle in the mortar
(e) Speed and manner of mulling in the hand
(f) Time to be devoted to both the mixing and mulling
(g) Packing pressure

29. THE ORGANIC COMPONENT OF ENAMEL AT DIFFERENT AGES

Samuel W. Chase, Ph.D., School of Dentistry, Western Reserve University, Cleveland, Ohio

After a few weeks following the inception of amelogenesis—the period has not yet been definitely determined—enamel remnants, decalcified by Bödecker's method, are present as often and in amounts as great in old enamel (up to 48 years) as in very young enamel (3 months to one year).

30. A CONTRIBUTION TO THE ANATOMY AND PATHOLOGY OF THE HUMAN GINGIVAE[16]

William G. Skillen, D.D.S., Department of Histology, Northwestern University Dental School, Chicago, Illinois

Histological study of certain human material showed that apparently a gingival pocket (crevice) did not exist, even in advanced age or where so-called recession had occurred. This lends some support to the idea that perhaps such a structure should be considered a defect rather than a normal characteristic of the gingivae. In some instances the existing inflammation was traceable to very shallow pockets; in others, in the absence of pockets, to defects in the mouth epithelium. So-called recession, shifting of the epithelial attachment, or eruption

[16] To be published in the *Journal of Dental Research*.

of the teeth, had occurred very irregularly. It was difficult to correlate this change and the inflammation about the teeth. Proliferation of epithelium had advanced further in some instances where the inflammation was less, or even so negligible as closely to approach normality. On the other hand, recession and pathology seemed to be related. The gingivae in some cases had crossed the enamel-cemental junction without the development of a pocket or of any appreciable pathology. The same factors, whatever they may be, must be considered as taking effect at this later stage of change in the gingivae as in the earlier stages. Some of these gingivae doubtless would have appeared as clinical normals, although all showed various stages of inflammation. Measurements were made of certain features pertaining to the gingivae in these cases.

31. EFFECTS OF DIETS LOW IN MAGNESIUM UPON THE TEETH AND THEIR SUPPORTING STRUCTURES IN THE MOUTHS OF RATS[17]

Henry Klein, D.D.S., Sc.D., Elsa Orent, B.S., Sc.D., and E. V. McCollum, Ph.D., Sc.D., Department of Chemical Hygiene, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Md.

The feeding of diets containing all the known essential food elements, but low in the element magnesium, result in severe hyperplasia or hypertrophy of the gingiva in the rat, loosening of the teeth, and excessive deposition of calculus upon the teeth, particularly the molars.

32. GRANULOMATA AND CYSTS OF DENTAL ORIGIN

C. W. Waldron, D.D.S., M.D., F.A.C.D., and H. G. Worman, D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

A periapical granuloma is a favorable natural reaction to some form of injury to the tissues about the root-end of a tooth. This inflammatory tissue may or may not be infected, and may or may not contain remnants of epithelium known as the "epithelial debris of Malassez." On account of impairment in nutrition, pressure, infection, etc., some

[17] To be published in the *Journal of Dental Research.*

cells in a granuloma may die and become autolyzed. The result is fluid in the tissues. By osmosis nature endeavors to reduce the concentration of this fluid. Through this means, and by further necrosis of cells, the amount of fluid increases. If squamous epithelium is present, this epithelium, by proliferating, produces a protective lining of the cavity containing the fluid. Such cysts, in growing, may destroy much bone, and therefore should be diagnosed and removed early.

33. CLINICAL HISTOPATHOLOGICAL STUDY OF SO-CALLED EPULIS, AND CLASSIFICATION

C. W. Waldron, D.D.S., M.D., F.A.C.D., and H. G. Worman, D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

A survey of the literature and texts in pathology and surgery reveals so marked a lack of uniformity in the application of the term "epulis" that it should no longer be used, or applied solely as a clinical term to denote the situation of the tumor rather than its nature. If so used, it would be well to write it in parenthesis along with the pathologic designation of the tumor under consideration, i.e., (epulis) pyogenic granuloma, (eupulis) giant cell. *Proposed clinical-pathological classification:*

(Epulis) Connective tissue types

I. Inflammatory growths
   1. (Epulis) Localized hypertrophies
   2. (Epulis) Scar tissue—fibrous type
   3. (Epulis) Pyogenic granuloma

II. (Epulis) Fibroma; may show ossification
   Xanthoma, a variant of the fibromas; shows lipoids in fibroblasts; yellow

III. (Epulis) Giant cell

IV. Rarer forms of benign connective-tissue tumors of the gums are angiomas, endotheliomas, lipomas, myomas

V. Malignant connective-tissue
   1. (Epulis) Sarcoma; hard fibro-sarcoma, or soft, undifferentiated, round, or spindle types
   2. (Epulis) Melanoma; melanotic sarcoma; may involve gingival area

VI. Epithelial tumors of the gums and gingiva that may simulate the so-called epulis
1. Papillomas
2. Adenomas; may occur as mixed tumors
3. Papillary carcinomas; in early stages clinical diagnosis may be impossible before microscopic examination is made
4. Carcinomas of the infiltrating type may also project into the oral cavity at the gingiva, and simulate the pyogenic granuloma or the giant cell (epulis)
5. Adamantinomas (epithelial odontome) occur rarely as polyp-like growths on the alveolar border

34. EFFECTS OF NOVOCAIN SUPRARENIN ON DENTAL PULP

H. G. Worman, D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

According to the literature epinephrin, used as a hemostatic in novocain solutions in producing local dental anesthesia, causes pernicious effects on the pulp. Carefully selected teeth properly prepared and studied should show changes due only to the action of epinephrin, to prove the deleterious effects of the drug. A group of teeth, such as ours, not carefully selected, should show many more degenerations from various causes. Quite surprisingly, not even one tooth in the small group we have studied thus far has given histopathologic support to the theories regarding the deleterious effects of epinepherin on the dental pulp. Our results support the clinical findings. They do not show marked pathologic changes where epinepherin has been employed as a hemostatic agent in a local dental anesthetic.

35. STUDIES ON TRICHOMONAS BUCCALIS FROM THE HUMAN MOUTH

D. H. Wenrich, Ph.D., and L. H. Beatman, Department of Zoology, University of Pennsylvania, Philadelphia, Pa.

Although a number of studies have been made on the flagellate protozoon of the human mouth, commonly known as *Trichomonas buccalis*, there yet remain many unanswered questions concerning its morphology, physiology, and life history. For more than a year, there has been in progress in this Laboratory a program of studies

intended to extend our knowledge of the trichomonad flagellates of man, and especially the clarification of the taxonomy of this group. The incidence of *T. buccalis* in the mouths of 250 human beings was determined. Morphologic and cultural studies indicate that *T. buccalis* is very closely related to *T. vaginalis*, while these two are so different from the intestinal forms that the taxonomic distinctness of the latter cannot be questioned.

VI. Fifth Session: Afternoon, March 22; Abstracts 36–43

36. A report on dental caries in 10,445 university students: 1928–1930

P. J. Brekhus, B.A., D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

Object. This survey was conducted for the purpose of ascertaining the incidence of dental caries in a group of individuals socially favored both economically and educationally, all of whom were able to obtain the best dentistry has had to offer.

Subject material: University freshman students; average age, eighteen. The dental examination was conducted in conjunction with the complete physical examination given every freshman before admission to the University of Minnesota. In the dental examination the following findings were recorded: (1) teeth extracted; (2) teeth with caries and no fillings; (3) teeth with fillings—(a) amalgam, (b) gold, (c) silicate, (d) cement; (4) teeth not affected by caries.

Findings in 1928–30:

1928—3,346 students examined; found 34,384 affected teeth.

1929—3,388 students examined; found 33,697 affected teeth.

1930—3,711 students examined; found 38,283 affected teeth.

Total—10,445 students examined; found 106,364 affected teeth. Of the affected teeth, 8,958 had been extracted; 13,674 had active caries; the rest, 83,732, had fillings. This gives an average of slightly more than 10 teeth per individual affected by caries, and less than 1 tooth per individual that had been extracted. The per cent of *perfect mouth conditions* was very small, and seemed to be on a decline. It ran as follows:

Percentage of perfect mouth conditions

	1928	*1929*	*1930*
Male	4.70	2.55	1.58
Female	1.80	.81	1.28

Comment: It is interesting to note (below) how the percentages of the several filling materials correspond in the three different years. This may be of minor importance in this study, but it indicates certain fixed habits in the profession regarding treatment of caries.

Percentage of filling materials used

	1928	*1929*	*1930*
Amalgam	73.0	72.76	72.17
Gold	17.3	17.62	17.36
Silicate	8.2	8.17	8.89
Cements	1.5	1.45	1.58

The most significant result of the study is the variable degree of susceptibility to caries in the different teeth. In comparing figures we find it convenient to divide the twenty-eight teeth into seven groups which brings out the following results:

Group	I	II	III	IV	V	VI	VII
Teeth	$\frac{6}{6}$	$\frac{7}{7}$	$\frac{5}{}$	$\frac{4}{5}$	$\underline{2,1}$	$\frac{3}{4}$	$\frac{}{3,2,1}$
Percentage having caries	95	75	45	35	30	10	3

I believe that this variable degree of susceptibility to caries in the different teeth (3 per cent to 95 per cent) offers a field for profitable research on the etiology of dental caries. Work on this problem is now in progress at this School.

37. HISTOLOGIC STUDY OF DEVELOPMENT AND POSITION OF DECIDUOUS AND PERMANENT TEETH FROM BIRTH TO FOUR AND ONE HALF YEARS, WITH SPECIAL REFERENCE TO THEIR SURGICAL SIGNIFICANCE

William H. G. Logan, D.D.S., M.D., M.S., LL.D., F.A.C.D., F.A.C.S., Chicago College of Dental Surgery, Loyola University, Chicago, Ill.

The histologic study of the development and position of the deciduous and permanent teeth from birth to six months was instituted to ascertain if it were possible to carry large needles and silver wire, used for sutures in the correction of complete congenital cleft-of-palate,

without disturbing the developing deciduous and permanent germs of teeth, provided, in the opinion of the operator, such a procedure was advisable. The findings presented a number of points of new information. Probably the most important was that the germs of developing bicuspids in the first six months of life were located in a position occlusal to the deciduous molars. The development of the bicuspids from the occlusal position was traced in the various ages up to 4 1/2 years, when they were shown to be situated above and between the roots of the deciduous molars, and the route taken was from the occlusal to the mesial of the corresponding deciduous molar and passing into the bifurcation from the lingual-mesial aspect. The practical application of the findings was shown by models and photographs of a child with complete congenital cleft-of-palate, at two months of age, before and after operation; and models and photographs of the same patient taken at one year of age.

38. HISTOLOGIC VERIFICATION OF RADIOGRAPHIC DIAGNOSIS IN TEETH WITH PULP-CANAL FILLINGS

Earl P. Boulger, D.D.S., L.D.S., Chicago College of Dental Surgery, Loyola University, Chicago, Ill.

This study was intended to determine whether there is any definite relation between the radiographic findings on pulpless teeth and the microscopic findings about the root ends of the same teeth after their extraction. The investigation was made from a diagnostic standpoint, and not to examine any particular method of pulp-canal therapy. In many instances teeth that had been treated in this college several years ago, in other cases teeth without known history, were used. The root ends of teeth that, in the radiographs, showed definite evidence of bone resorption, disclosed the presence of inflammation when examined microscopically. On the other hand, in teeth that were radiographically normal, the histologic findings revealed the presence of uninflamed connective-tissue around the apices. New layers of cementum deposited on the root surface of such teeth, and in the unfilled apical part of the root canal, gradually reduced the remaining vital-pulp stump to a very fine strand of fibrous connective-tissue. There was no microscopic evidence to prove that these teeth, any more than teeth

with vital pulps, could be harmful to the individual. This study is being continued, particularly with reference to teeth with known therapeutic histories.

39. HISTOLOGIC STUDY OF SOFT AND HARD TISSUES OF EDENTULOUS MAXILLAE, AND THEIR RELATION TO THE PROBLEM OF FULL-DENTURE RETENTION

Elbert C. Pendleton, D.D.S., Chicago College of Dental Surgery, Loyola University, Chicago, Ill.

A histologic study was made of three human maxillae from persons aged 43, 45, and 58, respectively. Sections made in several vertical planes through the entire width of the jaw presented a comparative study of the tissues in each area of the jaws. Sagittal sections through the median line included the tissues labial to the maxillary ridge, the ridge with its covering, the vault of the palate, the soft palate, and all of the structures intimately associated with them. Sections in a frontal plane, from the anterior half of the soft palate to the bicuspid region, present the vault, ridges, and associated parts. Labio-lingual sections in the incisive region show the maxillary ridge, the hard palate, and all of the soft tissues in this region. Histologic examination of three individual maxillae, from specimens of different age and sex, showed the same basic arrangement, distribution, and location of the tissues. This study has aided in establishing boundaries of the areas of retention, and has given a more comprehensive idea of the structures in the several areas.

40. CONTRIBUTION TO THE KNOWLEDGE OF THE PROCESS OF REPAIR FOLLOWING TOOTH FRACTURE[18]

Rudolf Kronfeld, M.D., Chicago College of Dental Surgery, Loyola University, Chicago, Ill.

In a lower central incisor, obtained during autopsy, a crack was found on the root surface. A part of the cementum was torn away from the dentin of the root, thus forming a narrow space between these two hard substances. From the periodontal membrane connective-

[18] Published in the preceding issue (April): *Journal of Dental Research*, 1931, xi, p. 247.

tissue cells grew into this space, and fibroblasts and wandering cells could be found in the fluid that filled the crack; the arrangement and form of these cells were similar to a tissue culture. One could expect that later, in the development of the organization, these fibroblasts would form normal connective tissue and so start the reparative process in the area of the fracture.

41. SOME FACTORS THAT GOVERN STRENGTH IN PORCELAIN

W. D. Vehe, D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

Dental porcelain, not unlike other porcelains, has the distinct disadvantage of being brittle or friable. This quality at times becomes embarrassing to the dentist in his restorative procedures, and makes it necessary for him to keep this potential possibility constantly in mind. Usage has conclusively demonstrated the weakness of thin areas of porcelain in any restoration. The U. S. Bureau of Standards has pointed out the effect of increasing its thickness, thereby increasing its strength, not in the same proportion but as the square of its thickness. This makes it obviously desirable to obtain all the bulk or thickness that is possible in a restoration or porcelain piece. Of course, the future health and comfort of the living pulp is of even greater importance, so that bulk of material, no matter how necessary, must really be a secondary consideration. Not much work has been done to determine the best type of shoulder or base in a preparation, for a veneer crown for instance, or whether a shoulderless preparation has the disadvantage now attributed to it. Practical experience indicates that a generous shoulder is desirable as a strengthening factor in this type of porcelain restoration.

It is now definitely known that the treatment that porcelain receives during the building and fusion process may make a tremendous difference in its strength. The work of the U. S. Bureau of Standards, in porcelain, though limited in scope, has been helpful. Gill, of the University of California, has made valuable contributions on the behavior and density of dental porcelains. His work shows quite conclusively that density in porcelain is obtainable by a thorough and proper condensation before it is subjected to fusion. He also points

out the prevailing characteristics of porcelain condensed in different ways. Opinion is divided on the part that fusion plays on the strength of porcelain. It is well known, however, that overfusion is detrimental, if not ruinous. Underfusion must likewise affect its strength through an improper union with the binding substance. I know of no reliable data on the effect of annealing on the strength of porcelain. In the arts porcelain is subjected to a very slow cooling after the final firing for the purpose of reducing its brittleness. The supposed good effects of this annealing have been questioned. Until more reliable information is obtained, this procedure must remain empirical. Experimental findings so far indicate that a low-fusing or a high-fusing porcelain may inherently be either a weak or strong body, and that an increase in its indicated fusing temperature does not imply anything relative to its strength or resistance to crushing forces.

To summarize: the known factors that govern or contribute strength in porcelain are the bulk of material, and a proper condensation of it during the building-up process. It may be ruined during the fusing process. It is believed that slow cooling produces a greatly desired tenacity. Much remains to be done to obtain a more rational understanding of the chemical and physical qualities of porcelain. An intensive study is in progress. It is hoped that much helpful information will continue to be forthcoming to aid the general worker to a better understanding of his problem.

42. COLOR STUDIES IN NATURAL AND ARTIFICIAL TEETH

George Wood Clapp, D.D.S., New York City

In 1910 Dr. J. Leon Williams and the writer combined their efforts toward the production of better forms and colors in artificial teeth. The following year we were joined by Prof. Alfred Gysi. While each was conversant with all that was being done, each had a definite task. The problems relating to improved colors fell to the writer. There was general dissatisfaction with the colors in artificial teeth, especially in the cuspids, but nothing of practical value towards correction could be found in the literature. There was at this time a laboratory well known in the commercial world for its work in identifying, measuring, analysing and recording colors—"The Tintometer," at Salisbury,

England. In the summer of 1912 the writer hired the greater part of the technical staff of this laboratory, together with its facilities, and the summer was spent in color studies of natural teeth in the mouths of living, healthy patients. The results showed that the problem was much greater than had been foreseen, that its components were very elusive, and that new methods and apparatus would be necessary. Enough was learned, however, to permit advantageous color changes in the teeth which were produced, and to make them more pleasing in appearance than teeth had been. After the close of the war, color studies were again taken up seriously, this time on a new and more practical basis, and were continued for nearly ten years. During this time more than 2500 people have been used as subjects for careful identification, measurement and recording of tooth colors, usually for at least six teeth per person. These people were selected from a much larger number of possible subjects. More than 2000 sample teeth, arranged in carefully planned shade guides were made and used during the studies. By careful tabulation this number was gradually reduced to 24, and these constitute the shade guide resulting from these studies.

During the early part of the work great difficulty in matching natural teeth was encountered from the fact that some of the grays, reds, and oranges seen in natural teeth could not be duplicated in porcelain. About two years were spent with the technical staffs of some of the world's leading color makers, without success. After ten years of effort, the ceramic laboratory of the Dentists Supply Co. of N. Y. solved the problem of making the necessary colors, and also devised entirely new ways of using color in dental porcelain. These achievements made possible color effects in teeth which were before unknown.

One of the things which made matching of natural teeth difficult was the fact that the color in artificial teeth could not, by any known method of manufacture, be placed as it was in natural teeth. It proved possible to devise an entirely new method of manufacture which permitted a natural placement of the color, but more than five years of experimentation were required to make the method practicable. The best methods known for fusing the dental porcelain in which it was intended that the colors should be incorporated were in-

capable of giving uniform results because of wide and sometimes sudden variation of heat in the muffle in which the teeth were being fused. New methods capable of an astonishing uniformity of results have been devised. In 1924 the writer's vision failed from too close application in the intense concentration necessary in the recognition and measurement of tooth colors. The work was then taken up by younger men, and has been carried to successful completion by the application of a very high order of intelligence and unceasing industry.

The practical results of nineteen years of work in this special field are that the tooth colors which have been produced are capable of from four to five times as many satisfactory matches of teeth as were possible from any commercial shade guide when the work was begun. It was then possible to get fair matches for only about 15 per cent of natural teeth. Now, matches superior to those then obtainable may be had for about 60 per cent of teeth, and matches equal to those then obtainable may be had for about 15 per cent additional. Probably 25 per cent of natural teeth cannot be satisfactorily matched with any commercial guide. They require the services of dentists capable of skilfully staining teeth.

43. CEPHALOMETER AND PLOTTING INSTRUMENT

Frederick Lester Stanton, D.D.S., Dental School, New York University, New York City

The instruments, designed by the author and Gilbert D. Fish, C.E., are used for locating and plotting all accessible points on the head in a study of three dimensional growth. The cephalometer is immobilized by locking to a dental-impression tray after the placement of the tray in the mouth. Impression plaster contained in the tray is allowed to set before attachment of the cephalometer. Proper orientation to the ear axis is obtained (i.e., leveling in two directions) by swinging the moving arm of the cephalometer against an anthropometric compass previously inserted into the ear holes. The moving parts of the cephalometer permit the placement of the surveying pointer on any desired head point, the location of which is determined by reading two angles on attached protractors. The head map is made with a plotting instrument whose plotting pointer reproduces the position of the

surveying pointer when the plotting protractors record the same angles as the protractors on the cephalometer.

VII. Sixth Session: Evening, March 22; Abstracts 44–46

(Including annual dinner and annual business session)

44. President's address: several urgent problems in dental research

U. Garfield Rickert, M.S., D.D.S., F.A.C.D., School of Dentistry, University of Michigan, Ann Arbor, Mich.

Published in full on pages 438–49.

45. A preliminary report of personality traits essential to the success of a practising dentist[19]

Robert K. Brown, D.D.S., M.S., School of Dentistry, University of Michigan, Ann Arbor, Mich.

The successful dentist accomplishes what he attempts or attends. He attains the object or end desired, which, according to Dr. Herman Prinz, is "to reduce suffering, to cure disease, and what is most important of all, to maintain health by dental prophylaxis." We have taken a list of fifty traits compiled by Prof. J. F. Dashiell of the Psychology Department of the University of North Carolina, and have sent this list to one hundred dental teachers throughout the United States. We requested each to select twenty traits in the order of the importance of their possession. Seventy-nine lists were returned marked according to my request. A similar request will be sent to one hundred successful practising dentists throughout this country. The twenty traits selected by this survey will have their trait actions defined and, for a final check up, will be sent to the men who have aided us in our study. We should then be in possession of comprehensive information as to what constitutes a successful dentist. This information should be of value to the dental student, the dental teacher, and the general practitioner alike. Our first survey from this original list of fifty traits, as shown in *Summary A*, has given us the twenty-two traits listed in *Summary B* as being the most important

[19] Published in full in this issue: *Journal of Dental Research*, 1931, xi, p. 363.

Summary A

Original list of fifty traits of personality as compiled by Professor J. F. Dashiell

1. Robust physique
2. Energy (live-wire type)
3. Good memory
4. Tactfulness
5. Good personal appearance
6. Initiative
7. Patience
8. Industry
9. Resourcefulness
10. Accuracy
11. Readiness of speech
12. Keen observation
13. Self-control
14. Matter-of-factness
15. Aggressiveness
16. Optimism
17. Honesty
18. Leadership
19. Courage
20. Religiousness
21. Self-interest
22. Impressiveness of appearance
23. Sympathy
24. Open-mindedness
25. Precision
26. Cautiousness
27. Neatness and orderliness
28. Ability to be "a good mixer"
29. Refinement
30. Adaptability
31. Suggestibility
32. Emotional stability
33. Investigativeness
34. Possession of good habits
35. Self-assurance
36. Ability to make a quick decision
37. Reflectiveness
38. Impulsiveness
39. Thrift
40. Masterfulness
41. Stable-mindedness
42. Punctuality
43. Boldness
44. Firmness
45. Analytical-mindedness
46. Originality
47. Speculativeness
48. Independence
49. Conservatism
50. Economy

Summary B

The twenty-two most important traits selected by seventy-nine dental teachers throughout the United States, and their ranking compiled by three different statistical methods, with a final or order-of-merit listing of these selected traits

TRAIT NUMBER*	NAME	L.F.	M.W.	PER CENT	AV
		1	2	3	RK
17	Honesty	1	1	1	1
10	Accuracy	2	6	9	5.6
4	Tactfulness	3	5	3	3.6
8	Industry	4	2	8	4.6
5	Good personal appearance	5	4	13	7.3
34	Possession of good habits	6	8	5	6.3
23	Sympathy	7	10	4	7.0
13	Self-control	8	9	11	9.3
29	Refinement	9	13	6	9.3
12	Keen observation	10	11	12	11.0
6	Initiative	11	7	14	10.6
7	Patience	12	12	7	10.3
42	Punctuality	13	15	10	12.6
9	Resourcefulness	14	14	15	14.3
25	Precision	15	16	20	17.0
1	Robust physique	16	17	19	17.3
3	Good memory	17	18	18	17.6
24	Open-mindedness	18	x	16	17.0
45	Analytical-mindedness	19	x	17	18.0
19	Courage	20	19	x	19.5
27	Neatness and orderliness	x	3	2	2.5
35	Self assurance	x	20	x	20.0

* In Summary A.

to possess. The order of their rank is shown by four methods of tabulation. The last column or average rank is the one from which the final ranking will be determined.

46. A LIVING AMERICAN DENTIST'S EPOCHAL INTELLECTUAL CONTRIBUTION TO WORLD HISTORY[20]

William J. Gies, Ph.D., Sc.D., LL.D., F.A.C.D., F.A.A.P., Medical School, Columbia University, New York City

The author indicated the origin and general nature of *The Social Interpretation of History: A Refutation of the Marxian Economic Interpretation of History*, which was written, in 1919 and 1920, by a practising American dentist who had been an active member of the Socialist Party for about twenty-five years. This book set forth the conviction that the Marxian economic interpretation of history and the destructive influences arising therefrom, as illustrated in Russia, were unsound in fact and fatal in effect. It presented, instead, a social philosophy founded on historic realities. At its base, as a permanent force in the evolution of civilization, was placed the inevitable struggle for subsistence—the law of self-preservation. Upon this was founded the needs of the consumer as contrasted with the privileges of the producer. Class coöperation instead of class warfare, considerations of humanity instead of preferences for violence, friendship instead of hostility, were made agencies for individual well being, happiness in the home, contentment in communities, peace among the nations, and the ensuing spread of refinement and culture.

Facts showing initial indifference to this work, published in 1921, followed by gradual appreciation among eminent philosophers, historians, and statesmen, were cited, the most remarkable being the acknowledged influence of the book upon the history of China and the ensuing world relationships. Dr. Sun Yat-sen, the venerated leader of the successful Chinese revolution, in the closing period of his career, used the book for the formulation of the national program, having been converted by the book from a pro-Marxian position in sympathy with Russian communism to an anti-Marxian position in accord with American ideals. Some of the direct evidence showing

[20] Published in the *Journal of the American Dental Association*, 1931, xviii, p. 981; June.

that Dr. Sun "based his anti-Marxian position almost verbatim upon this book" was presented, including quotations from the English edition of Dr. Sun's published lectures, *San Min Chu I* (1924), compared with the American dentist's *Social Interpretation of History* (1921). The Chinese editor of the English translation of Dr. Sun's book has written (1928) that the American dentist's "*Social Interpretation of History* was a constant companion to him" [Dr. Sun]. Recently (1931), the President of one of the Chinese universities said of this extraordinary situation: "It is certainly curious that an American dentist should have turned the whole current of political thought for the man [Dr. Sun] whose writings at present are the Bible of the dominant political party in this country." *The Social Interpretation of History* has become a decisive influence in world history. The spiritual and intellectual character of this work will always be among the irreducible assets of American dentistry. Its distinguished author practises dentistry at 130 West 57th Street, New York City. His name is Maurice William.

VIII. Papers Read by Title; Abstracts 47–80

A. Contributions by members of the Vienna Section: Abstracts 47–66; all were available at the meeting

47. Emphysema arising in connection with the treatment of teeth having diseased roots

Arved Berg, M.D., Jaw Department (Director Prof. Dr. H. Pichler), First Surgical Clinic (Director Prof. Dr. A. Eiselsberg), University of Vienna, Vienna, Austria

After considering the mechanism of the development of traumatic air-tumors in the region of the facial bones, another mode of development of facial emphysema is discussed, namely that involved in manipulations in dental work, such as tooth extraction, injury of the buccal mucous membrane, but chiefly the use of the air syringe during root treatment. Experiments on dead bodies, and daily observations on patients, show that it is impossible to infiltrate the soft parts of the face with air through an open root-canal when the alveolar bone is uninjured and intact. Etiologically the following conditions are to be considered: injuries, congenital gaps or thinness of the alveolar

wall, periapical inflammatory processes and granulomata burrowing through the bone and the periosteum into the layers of the soft parts. Pressure values that are influential in these conditions vary between 8 and 90 mm. Hg, equalling those estimated in maximal and forced respiration (coughing). Differential diagnosis: medicamentous oxygen emphysema.

"Air-syringe emphysema" occurs instantaneously, is generally limited to the immediate surroundings of the treated tooth, and presents itself chiefly as edema of the cheeks and lids. Generalization was not observed. It disappears in two or three days, leaving no disturbances. The only discomforts at the time of its appearance, besides the external disfigurement, are a brief sensation of pain and later a troublesome tension. The treatment is symptomatic. As to prophylaxis, one should avoid the application of warm-air syringes or pressure air for the purpose of drying the walls of the root-canals in teeth with diseased roots, with or without fistulas. Emphysema occurring only once is no indication for the extraction of a tooth.

48. ELECTRIC TESTING OF TEETH WITH D'ARSONVAL CURRENTS[21]

Alfred Borschke, M.D., and Hermann Wolf, M.D., Jaw Department (Director Prof. Dr. H. Pichler), First Surgical Clinic (Director Prof. Dr. A. Eiselsberg), University of Vienna, Vienna, Austria

Although it is impossible to measure the quantity of electricity in using d'Arsonval currents to test vitality, this method has the advantage, under certain applications and when used for a short time, of showing sensitiveness in living pulps only. Disturbances that make other methods difficult, such as resistance of the enamel, derivation of the currents from moisture, metal fillings, or crowns, are not so troublesome in tests with d'Arsonval currents. This is simpler than the other methods of electrical testing, and therefore can be applied more frequently. A small and cheap apparatus, named "Mediofor," is well adapted for the purpose.

[21] Borschke und Wolf: Eine neue Methode der elektrischen Zahnuntersuchung, *Zeitschrift für Stomatologie*, 1929, xxvii, p. 202. Die Durchführung der elektrischen Zahnuntersuchung mit Arsonvalströmen, *Ibid.*, 1930, xxviii, p. 105.

49. HISTOLOGIC CHANGES IN THE JAW AND ITS JOINT CAUSED BY JUMPING THE BITE, AND BY THE USE OF INTERMAXILLARY RUBBER BANDS

Karl Breitner, M.D., Histological Laboratory (Director Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria

The changes of the tissues produced by "jumping the bite" were shown in an experiment on a monkey (*Macacus rhesus*) about a year old. Crowns were cemented on the back teeth, which affected the chewing-surfaces of the molars in such a way that the animal could close its mouth only by shifting forward the mandible. We found changes in the joint, angle of the lower jaw, and bone surrounding the teeth. Similar changes were produced in other experiments by the use of intermaxillary rubber bands. In cases of "jumping the bite," the changes around the teeth were dominant because the teeth were overloaded by the treatment. We came to the conclusion that a change in the occlusion by "jumping the bite" is not desirable, at least in the permanent denture.

These experiments showed the topography of the tissue changes caused by the orthodontic methods in general use for changing the occlusion. They also afforded a new proof of the theory of biologic movement of teeth. They showed further that applied forces were not inactive, but affected normal jaws as they influence jaws under pathological conditions. Thus we were able, with intermaxillary rubber bands, to produce artificial Angle Classes III and II.

50. INFLAMMATORY DISEASES IN THE DENTAL SYSTEM IN NEPHRITIS: A CONTRIBUTION TO THE STUDY OF FOCAL INFECTION

Fritz Driak, M.D., Jaw Department (Director Prof. Dr. Hans Pichler), First Surgical Clinic (Director Prof. Dr. A. Eiselsberg), University of Vienna, Vienna, Austria

We report on six cases of nephritis, in which the internist suspicioned that there was a connection with periapical dental diseases. The ages of the patients ranged between 20 and 43 years. In four cases nephritis appeared without any known reason, in one case after in-

fluenza. General therapy (hunger and thirst) having failed to induce recovery, we looked for other causes, and found them in teeth or tonsils. After removing them, real improvement followed. After tooth-extraction or tonsillectomy there was deterioration in most cases, consisting of increase in urinary albumen and in number of erythrocytes, and more rapid decrease of the erythrocytes. In case six, however, we observed bacteriuria, but neither albuminuria nor hematuria. In these cases teeth did not fall out nor was there anemia of the gums, as described by M. L. Rhein.

In order to explain the connections between these conditions, we tried to find in the urine streptococci from the granulomata and to ascertain whether the same symptoms could be elicited with cultures in animal experiments. One test was successful, another was not. After the extractions we made examinations of the urine at different times in the supposition that bacteriuria might follow the irritation ensuing from the operation. In case six, after extraction of four teeth, we found streptococci in the urine $2\frac{1}{2}$, $3\frac{1}{2}$, and 17 hours after the extraction. Possibly these results were accidental, but the examinations will be repeated. Perhaps it will be possible, by differential bacteriological methods, to identify the streptococci from dental foci with those in the urine, and therefore to reduce the large number of cases with "kryptogen infection." Of course mistakes in these bacteriological examinations must be avoided. Urine must be examined immediately after elimination. The treatment-possibilities are summarized below:

(1) Tooth-extraction

(2) Extraction and ex-cochleation. The danger of ex-cochleation should not be underestimated (opening of the antrum of Highmore or of the mandibular canal, propagation of an infection), and it should be applied only when essential.

(3) Root-treatment. After perfect filling, the granuloma becomes less in most cases or heals completely. The filling (cement, argentum praecipitatum, vioform, thymol) seems to have a bactericidal effect, as was shown in case six, where, after the extraction of $\overline{7, 6, 5, 4,|}$ only the one that had been perfectly filled, $\overline{5,|}$ was sterile.

(4) Root-resection, with operative removal of the granuloma.

(5) Surgical opening or ex-cochleation of the isolated diseased

places in the jaw. It is well known that granulomata which have not been removed may incite exacerbations and cause rise of temperature, suppuration, swelling, etc.

If the internist makes the diagnosis "nephritis," we must look for focal infection (teeth, tonsils, accessory nasal cavities) besides applying general therapy. It is the duty of the dentist to care for the mouth thoroughly, and not to overlook anything that might cause a severe general disease.

51. EXPERIENCES WITH THE "GAZOTHERME-DEGUSSA" (FOR THE ANESTHESIA OF DENTIN)

Fritz Driak, M.D., Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria

It is possible to anesthetize dentin by the induction of a low temperature. There are various types of complicated apparatus for this purpose. We have experimented with the "Gazotherme," which was first introduced and described in Paris, in 1920, by F. Fabret. Originally the firm of Ph. Tiranty, Rue la Fayette, Paris, made this apparatus. Now it is made only by the firm of Degussa, Berlin-Pforzheim. It has been described by G. Blessing, F. Fabret. Ch. Guebell, J. Kieffer, J. Wellisch, and others. (*Fig. 1.*)

When progressive refrigeration acts on painful dentin, the cold may not be felt, if it is applied very gradually. The apparatus for this purpose consists chiefly of (a) two steel bottles filled with compressed oxygen, one serving only as a reserve; (b) one bottle with fluid carbonic acid; (c) a regulating box with a flow-tube for oxygen in the mouth of the patient, and with a second tube for the carbonic acid, which does not come into contact with the patient; and (d) a little electric heating-apparatus (8–10 volts) to warm the oxygen in very sensitive cases. The gas-pressure in the bottles may be controlled by manometers. There is a special reducing-ventil for oxygen, which, at room-temperature or eventually warmed, is brought (in the beginning at 0.5 atmosphere, later at 1.5–2.5) to the cavity in special sterilizable metal-pieces (cannulas), thus drying the dentin at the outset and making it less sensitive. Then this oxygen current is indirectly cooled by the carbonic acid to from 3°C. to 5°C., or eventually lower, when the cavity preparation can be made painlessly.

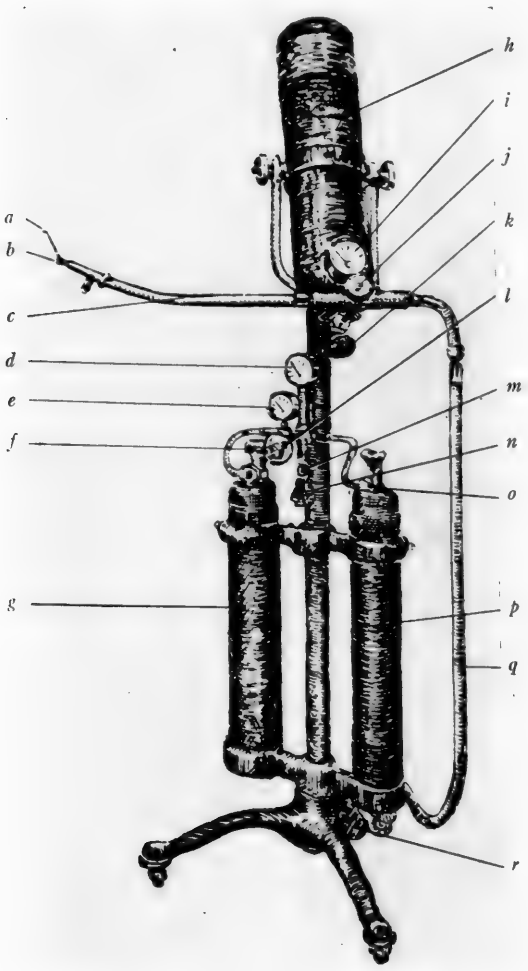

FIG. 1. "GAZOTHERME-DEGUSSA"

a, cannula. *b*, double ball-and-socket joint. *c*, mouth bracket. *d*, manometer, oxygen pressure. *e*, working manometer, oxygen. *f*, ventil, oxygen bottle. g, oxygen bottle. *h*, bomb, CO_2. *i*, manometer, CO_2 pressure. *j*, regulating ventil, CO_2. *k*, ventil, CO_2 bomb. *l*, reducing ventil, oxygen. *m*, junction. *n*, ventil, oxygen (filling). *o*, ventil, oxygen bottle. *p*, oxygen bottle. *q*, elastic tube. *r*, contact screws, heating apparatus.

In fifty patients at the Dental Institute (22 men, 28 women), for whom it was almost impossible to prepare a cavity because of abnormal sensitiveness of dentin, 29 cavities were in the labial (and buccal) gingival third (Class V, Black's system); 21 were cavities of Classes I, II, and III (Black's system). Front teeth and bicuspids especially were treated, but also some molars. The rubber dam was applied in all cases—for Class-V cavities, usually with the Hatch-clamp—to keep the cold acting only on the treated tooth. In 48 cases it was possible, by careful and slow oxygen-refrigeration, to prepare the cavities painlessly.

It is necessary to prepare the excavating instruments beforehand, as the anesthesia takes place very quickly and also disappears just as quickly. In 20 instances it was necessary to warm the oxygen with the electric-current, because the oxygen at room temperature caused pain. The oxygen was warmed in the gas-tube (called "projector" by Fabret) with a spirit-flame. In urgent cases it is sufficient to blow hot-air into the cavity with a syringe during the introduction of the oxygen. Two cases of Class-II cavities in bicuspids had moderate pain during the preparation of the axio-gingivo-lingual and buccal cavity corners. In a 12-year old boy, large Class-V cavities in the front teeth that could not be touched with a probe without causing pain, were given painless preparation by this method. After this treatment the tooth is very dry. Therefore we recommend that lukewarm water be sprayed into the cavity.

We can confirm the opinion of different authors that the pulp is not injured by this refrigeration method. We have examined with electricity and röntgen rays most of the teeth that we treated by this method a year ago. In each instance the periapical region was normal in the roentgen picture, and the pulp was intact according to the tests with the electric current. Besides these good results with cavities in teeth having intact pulps, the "Gazotherme-Degussa" was also used with good effect to prepare retentions for arsenic inlays, and for temporary fillings in sensitive cavities near the pulp.

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(2) Blessing, G. 1928 *Deutsche Monatsschr. f. Zahnhk.* H. 24, p. 1249.

(3) Guébell, Ch. 1925 L'anaesthésie dentaire par la refrigeration progressive; Paris.
(4) Kieffer, J. 1924 *Ztschr. f. Stomatologie*, H. 11, p. 733.
(5) Welisch, J. 1925 and 1926. *Stomatologie*, H. 4, p. 371; *Ibid.*, H. 5, p. 468.

52. TISSUE CHANGES IN EXPERIMENTAL TRAUMATIC OCCLUSION, WITH SPECIAL REFERENCE TO AGE AND CONSTITUTION[22]

Bernhard Gottlieb, M.D., and Balint Orban, M.D., Histological Laboratory (Director Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria

Clinical observations showed, long ago, that dentures of young individuals are far more resistant to traumatic occlusion than dentures of old individuals. No anatomico-scientific basis existed, however, to support this clinical observation. In the histological examina-

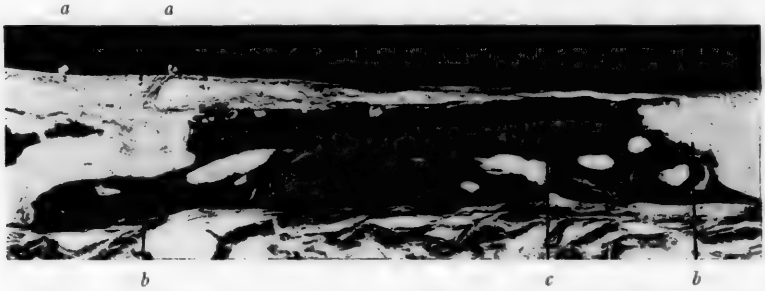

FIG. 2. *a*, resorption of cementum. *b*, resorption of bone. *c*, compressed periodontal membrane.

tion of the specimens in an extended experimental study of traumatic occlusion, we found a morphological difference between the reaction of the teeth of young dogs and of those of old dogs under the same conditions. The importance of age could be observed throughout the experiments, in which thirty-three dogs were used. Traumatic occlusion was produced for from 12 hours to 13 months. There were differences in the *duration* of the trauma required to cause initial resorptions on the surface of the roots, and also in the *extension* of resorption of the cementum and the *frequency* of the same. The re-

[22] These experiments were started with the coöperation of Dr. R. Kronfeld. Owing to his removal to Chicago, he was not able to continue his coöperation. We express our sincere thanks for his help.

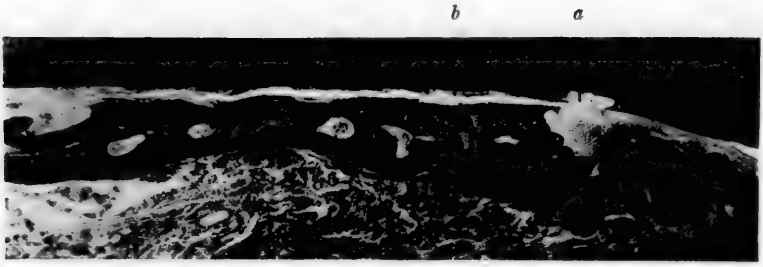

FIG. 3. *a*, symmetrical resorption of cementum and bone. *b*, compressed tissue of periodontal membrane.

FIG. 4. *a*, right lower tooth in traumatic occlusion. *b*, left lower tooth without trauma

sorptions on the surface of the roots always appeared in the vicinity of the places of highest pressure. The differences in the extent of resorption of tooth as well as of bone were very large in all the animals. The largest fluctuation however occurred in the youngest animals. Below we illustrate the foregoing statements.

Fig. 2 shows the first resorptions on the surface of the root after *6 days* of trauma. It is from a young but grown-up dog. Resorption on the alveolar bone was induced by 24 hours of trauma. After 6 days of trauma the resorption was quite extensive. The resorptions

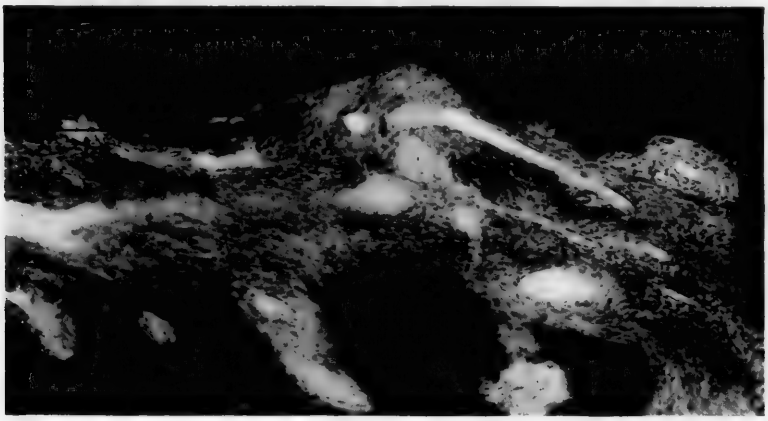

FIG. 5. *a*, necrotic tissue on the surface of cementum. *b*, repaired resorption of cementum.

on the surface of the root however were quite small in comparison with the destruction of bone in the same duration of trauma. As a rule, however, the first resorptions on the surface of the cementum do not develop in 6 days of trauma. In other experiments on younger animals the first tooth resorption occurred in 14 days. In the older animals we observed very interesting conditions. These were (*fig. 3*) symmetrical resorptions of tooth structure and alveolar bone at the places of highest pressure. This picture relates to the tooth of an older animal, which had been subjected to traumatic occlusion for four weeks. Here too the resorption of the alveolar bone is more extensive than that of the tooth. The symmetry of the resorption is

striking. In the experiments on young animals with a much longer period of trauma we found on the surface of the root very slight changes unlike the extensive resorption and new production of bone. *Fig. 4* shows the mesial roots of the right (a) and left (b) lower side of the jaw of a very young animal. The right upper and lower teeth had been covered with crowns to produce traumatic occlusion. The left side was used as a control. The duration of trauma was 1 month and 18 days.

FIG. 6. *a*, necrotic tissue on the surface of the root. *b*, alveolar bone

By comparing the position of both roots we can judge the amount of movement that took place during the experiment. The right root (a) stands deeper in the mandibular bone, its apex is nearer the surface of the bone and the alveolar margins are lower than those of the left tooth. During the period of trauma various changes took place in the periodontal membrane and alveolar bone. These changes, as we observed in shorter experiments, were compression of the periodontal membrane with necrosis of the tissues, thrombosis of the vessels, and resorption of the alveolar bone. In this young animal this kind of destruction was not observed. By the movement of the tooth into

the alveolus, the traumatic occlusion has changed and all the destructions have been repaired. The only signs to suggest that the above mentioned changes took place are seen in *figs. 5* and *6*. *Fig. 5* shows the bifurcation between the mesial and distal roots of the lower right tooth. It shows necrotic remains of tissue on the surface of the cementum, and partly repaired resorptions of the cementum. When we compare the extensive resorption of the bone, which must have taken place to permit the movement of the tooth as seen in *fig. 4*, and the small resorptions on the tooth, we see evidence of the resistance of the cementum of young animals against pressure. *Fig. 6* is a section of the bifurcation of an upper right tooth. The only sign of a former destruction is the small piece of necrotic tissue on the surface of the

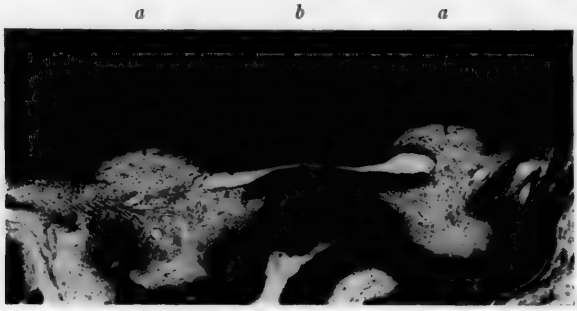

FIG. 7. *a*, symmetrical resorption of cementum and bone. *b*, compressed and necrotic tissue between bone and cementum.

cementum. From the study of all the other specimens we can state that on this place the pressure between tooth and bone destroyed the periodontal membrane. The destruction has been repaired by resorption of bone and necrotic tissue. The last sign of the destruction is the little piece of necrotic tissue on the surface of the cementum.

Generally, younger and older animals react to trauma in the way described, but there are some differences owing, we believe, to individual variations in constitution. In one of our young but grown up animals, we found changes that are otherwise characteristic of old animals. These were symmetrical resorptions due to pressure (*fig. 7*). We found not only that resorption on the cementum takes place later than that on the bone, but also that the extent of this resorption is different in

different animals. Generally the surface of the root is more resistant in young animals than in old ones, but the constitution of the individual may play an important role in the reaction. On the side opposite that of pressure, that is, on the side of pull (traction), we found the same difference between the reaction of bone and of cementum. Much more bone is deposited than cementum. Usually not more cementum is produced than in control animals. No difference was observed in this relation between old and young animals. Cementum hyperplasia was rarely observed.

53. CHANGES IN THE PERIDENTAL MEMBRANE OF HUMAN TEETH IN TRAUMATIC OCCLUSION

Richard Grohs, M.D., Histological Laboratory (Director Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria

We have studied two jaws where some of the teeth have been in traumatic occlusion for apparently a long time. The histological specimens show signs of the trauma. The results are thrombosis of the blood vessels and necrosis of the peridental membrane at the places of highest pressure. Around these places resorption of the alveolar bone took place. On the side opposite the pressure, new production of bone was observed. No connection between marginal inflammation and the changes in the peridental membrane could be found. We conclude that teeth in traumatic occlusion should be ground until they come into normal occlusion. If teeth are missing, they should be replaced by bridgework. Teeth that have been tipped by loss of neighboring teeth are usually endangered by trauma, and should receive special attention.

54. SPONTANEOUS FRACTURES OF THE MANDIBLE

Otto Hofer, M.D., Jaw Department (Director Prof. Dr. H. Pichler), First Surgical Clinic (Director Prof. Dr. A. Eiselsberg), University of Vienna, Vienna, Austria

We report a study of 25 cases of jaw fracture that occurred, free from external causes, as a result of diseases of the jaw. Among these cases 7 were caused by malignant tumors (carcinoma, sarcoma); 2, by

osteodystrophia fibrosa localisata; 2, by cystic tumors; 9, by osteomyelitis; 3 by tuberculosis; 2, by tabes dorsalis. In many such cases we apply splints to the jaw before the bone has been fractured, thus making the splint much simpler and shortening the process of healing. In cases of spontaneous fracture, caused by malignant tumors, there is very often only a small dislocation of the end of the fracture because the mass of the tumor is, so to say, like a bandage for the bone. Greater dislocations of the bone are caused in these cases by diminution or degenerations of the tumor. In osteodystrophia fibrosa localisata and other cystic tumors of the jaws, combined with much loss of bone by operation, we construct the splint throughout before the operation. It is advisable, especially in cases of osteomyelitis, to apply splints early to influence favorably the healing process and the complications. In cases of tuberculosis we are able to effect healing of spontaneous fracture, and also in tabes dorsalis; although in the latter the prognosis is less favorable. The above cases, with the exception only of the tabetic, and the spontaneous fractures by malignant tumors, were cured with dental splints without operation.

55. INFLUENCE OF FUNCTION ON THE WIDTH OF PERIDENTAL MEMBRANE, AND CEMENTUM IN REGARD TO FUNCTION

Ernst Kellner, M.D., Histological Laboratory (Director Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria

The circumstances in which an apposition of cementum occurs on the surface of the root of a tooth have been the subject of very lively interest among dental surgeons for both theoretical and practical reasons. And rightly so, because a continuous new formation of cementum is a characteristic physiological property of a healthy tooth. Without a new apposition of cementum there is no installation of fibres on the cementum. However, inasmuch as the fibres of the peridental membrane are the agents of the functional stimulus on the alveolar bone if new cementum becomes deposited, an abnormal extension of the peridental membrane and a loosening of the tooth may occur. According to Gottlieb, the apposition of cementum represents a process of repair necessary for the purpose of maintaining the normal width of the peridental membrane. Also, the physiological erup-

tion of the teeth, i.e., their growth, can be compensated to a certain extent by this process of repair, viz., by a larger apposition of cementum in those places where a greater widening of the peridental membrane occurs than in others. This is the reason for the greater width of the cementum at the apex of the root and in the bifurcations. Haupl, Lang and Bauer explain this as due to the increased concussions to which the tips of the roots are exposed. These explanations have been refuted. Nevertheless, it appeared expedient to examine how the cementum and the peridental membrane were affected under normal concussion. If the authors in question were right, the cementum at the tips of the roots of teeth in lesser function should be less than at the root-tips of teeth in full function. In the case of impacted teeth the width of cementum should never be greater than that on the homologous comparative teeth. It has previously been demonstrated in the literature that impacted teeth and teeth without antagonists show, contrary to this theory, a larger quantity of cementum than the corresponding comparative teeth that are fully functioning.

That the process assumed by Gottlieb and his school is the rule was confirmed in further material consisting of 2 impacted teeth and 2 corresponding teeth in full function; 7 teeth without antagonists; and 7 teeth in normal masticatory movement, most of the latter, contrary to the former, strongly ground down. In the impacted teeth, which surely are not exposed to any concussion, the width of the cementum was greatest at the apex of the root, and in a stronger degree, also, than in the homologous teeth in full function on the other side of the jaw. Also the 7 teeth without antagonists had a larger amount of cementum than the 7 comparative teeth in full function. This means that increase in the width of the cementum at the apex of the root cannot be explained by functional-mechanical action. The tooth without an antagonist, if biologically active, resists, by a new formation of cementum, the elimination to which it is subject to a greater extent than one retained in the occlusal plane by articulation.

The width of the peridental membrane is usually less in impacted teeth and teeth without proper function than in teeth in full masticatory function. We therefore distinguish, with Gottlieb, not only a *pathological* width of the peridental membrane, but also a physiological width and a biological width. The *physiological* width is the one

possessed by the healthy tooth in full function, which of course varies in accordance with age and individual peculiarities. The *biological* width of the peridental membrane—the smaller one—is that width which, unaffected by functional conditions, is imposed solely by the biological laws of the dental system and is, one might say, maintained by the alveolar bone and the cementum as a "mutually respected distance." It exists in its purest form in impacted teeth.

56. SEVEN CASES OF DEATH FOLLOWING DENTAL TREATMENT

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Pichler's report, published in 1925, referred to eight cases of death after extractions of teeth. In the following contribution we consider seven additional cases in this Clinic. All the patients showed high temperature and phlegmonous swellings. Most of them on admission were already in a septic condition. All had been treated previously by dental surgeons or dentists.

Case 1: woman aged 42. *March 24:* complained of pain in right maxilla. Her dental surgeon recommended frequent cleansing of mouth and a tincture. *March 30:* sclera showed a yellow color. Temp., 39.8. Patient sent same day to Jaw Department by her physician. Examination revealed a stomatitis ulcerosa; submaxillary glands involved. There followed thorough cleaning of mouth, extraction of loosened teeth, and intravenous injection of neosalvarsan. *April 3:* temp., 40.5. Increasing discoloration of sclera. Patient received electrocollargol intravenously, and local treatment. *April 4:* temp., 39.1. All symptoms were worse. Patient died at night. Bacteriological investigation showed bacilli fusiformi and cocci.

Case 2: man aged 22. *December 9:* arsenic application in the tooth $\underline{4}$. *December 13:* filling of root canal. Same evening, heavy pain. Following days: increase of swelling, and pain on contact with teeth. *December 16:* removed filling of root canal; incision. *December 17:* incision, but no sign of pus. *December 19:* increase of swelling of upper lip, bronchitis and pleuritis exudativa. *December 20:* all symptoms worse; injections. *December 21:* death. Bacteriological investigation shows staphylococci.

Case 3: woman aged 30. *December 17:* wisdom-tooth pocket-infection in left mandible; tooth extracted and incisions made. *December 17:* temp., 39.2. Following days: at first diminution, later increase, of temperature. Repeated agues in spite of injections (septojod, argoflavin, urotropin, hexeton, etc.). *December 30:* death. Bacteriological investigation showed streptococci.

Case 4: man aged 24. *April 3:* violent pains of middle upper teeth. Following days: increasing pain, swelling, and temp. *April 9:* temp., 40.2; extraction of tooth $|\underline{2}$; incisions into palate, lip, and mucous membrane under upper lip, and injections. *April 10:* temp., 40.2; right eye closed by swelling. Intravenous injection of trypaflavin. *April 11:* rapidly declining; temp., 39.2. *April 12:* death. Bacteriological investigation showed staphylococci.

Case 5: man aged 27. For three weeks felt pain in left maxilla. *April 21:* seen for first time by his dental surgeon. *April 13:* $|\underline{5}$ tooth opened; x-ray films show no changes. *April 24:* $|\underline{5}$ no pain; $|\underline{1}$ was opened. *April 25:* swelling upper $|\underline{1}$; incision. *April 26:* swelling greater. *April 27:* extraction of $|\underline{1}$ and $|\underline{5}$; incisions, injections (septoid, serum); temp., 40.1. *May 8:* operation—sec. Krönlein-Frank, exenteratio orbitae, no pus! At night: exitus. Bacteriological investigation showed staphylococci.

Case 6: woman aged 19. Swelling about $|\overline{6}$. *April 27:* tooth opened by her dental surgeon. *April 28:* pain and swelling greater. *April 29:* ague; she was sent the same day to our Clinic. *April 30:* temp., 40.6; extraction of $|\overline{6}$; injections. Following days: high temperature (40.6, 41.0 . . . .), ague; incisions and injections. *May 6;* patient died. Bacteriological investigation showed streptococci.

Case 7: man aged 20 years. A dentist made root-canal treatment of $\overline{4}|\overline{4}$. *December 21:* dentist made root-canal filling; at night, severe pains. *December 22:* removal of root-canal fillings. *December 23:* swelling about $|\overline{4}$. *December 24:* incision in region of $|\overline{3, 4}$. *December 26:* patient sent to Jaw Department; temp., 40. All teeth in left mandible were loosened. *December 29:* temp., 40.6; incision, psychic disquietude; died at night.

All these patients varied between the ages of 19–27 years. They died either the 7th, 8th, 9th, 10th, 11th or 12th day of their treatment. Three of these cases concerned upper teeth, $|\underline{4}$, $\underline{2}|$, $|\underline{5}$; three cases, lower

teeth, $|\bar{6}$, $|\bar{4}$, $|8$. Case 5, with $|\underline{1}$, took the shortest course. In many instances there was no pus.

57. TOPOGRAPHICAL X-RAY STUDIES OF THE DENTURES OF CHILDREN

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On the frontal x-ray photographs of dentures of children up to the age of 4, the blades of the upper middle incisors are seen reversed obliquely on the sides. Thus they form a rhomboid fissure with the upper middle deciduous incisors. When the central and lateral incisors are superimposed upon each other, to the extent of one third to five sixths of the width of the crown of *2*, frequently *2* overlaps *1* in the direction of the blades. From four years $\underline{1|1}$ usually straighten out; the rhomboid disappears. The overlapping of *1* and *2* becomes constantly less and disappears completely, when the incisors erupt or more frequently remain only to a very slight extent. The dentition of the frontal teeth takes place simultaneously with a lowering of one or both *1*, which are often previously surmounted by *2* bladewards. The germ of the *3* ordinarily lies high under the lateral section of the base of the nose; borders on *2* without crossing it however. The premolar germs are frequently in the frontal elevation slightly lingually inclined. The germ does not lie—frontally seen—in the bifurcation of the deciduous molars, but often appears to be placed on the palatinal root of the deciduous molars. The axis of the germ and that of the corresponding deciduous molar form a laterally buccal and obtuse angle. Before the cutting of the premolar, the lingual inclination becomes slighter; it assumes ordinarily a vertical position. After the eruption its axis assumes a laterally buccal position. The germ thus describes a turn of its longitudinal axis around a sagittal axis, so that the crown alters its position from a lingual to a buccal one.

In cases of narrowness of the jaw, the overlapping of *1* and *2* usually becomes more pronounced, and does not disappear before eruption to the usual extent. Extremely frequent are turns of the upper incisor germs. The canines often cross the small incisors, and occasionally show a slight lingual inclination. Frequently there is also a persist-

ence of the rhomboid fissure. The physiological lingual inclination of the premolar germ is more pronounced. On sagittal x-ray photographs of the lateral lower jaw, a fissure between erupted $\bar{6}$ and the germ of $\bar{7}$ may be seen in children at 6–7 years. This fissure can be observed only in good developing dentures, where there are fissures between the deciduous frontal teeth. It is, so to speak, the x-ray pendant of the fissure formation of the deciduous frontal teeth. In cases of Class III according to Angle, the width of this fissure may be more or less pronounced. The germs $\bar{4}$ and $\bar{5}$ usually lie with a growing inclination toward the distal root of $\overline{IV}$ and $\overline{V}$, respectively, or immediately below the distal root, the older the child becomes. The more strongly this phenomenon is pronounced, the more the lower lateral row of deciduous teeth is usually displaced mesially in respect of the upper, the distal planes of $\frac{V}{V}$ form a step. In a smaller number of cases, germs $\bar{4}$ and $\bar{5}$ remain situated below $\overline{IV}$ and $\overline{V}$, respectively, till the later years of childhood; the distal planes of $\frac{V}{V}$ terminate in one plane. In cases of Class II according to Angle, it may happen that germs $\bar{4}$ and $\bar{5}$ are situated toward the mesial root of the corresponding deciduous molar or even below the same.

58. PLASTIC OPERATIONS ON THE ALVEOLAR RIDGE[23]

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After the loss of teeth, the alveolar processes that carried them is subject to involution, and what is finally left of these processes—a ridge that is more or less narrow and elevated—is called the alveolar ridge. This ridge is covered by an immobile mucous membrane on which a prosthetic appliance may rest (a mobile membrane is not suitable for this purpose). If in the mandible the area of immobile mucous membrane is very small or limited to a mere line, some small operations may be performed to make it larger, so as to give a prosthetic appliance a larger base.

[23] To be published in extenso in an American dental journal.

We have devised two operative methods that can be modified in some ways for this purpose. By the first method we take a flap from the mobile membrane in the neighborhood—a flap that has its base on the crest of the alveolar ridge—and fix its rawside onto the side-plane of the alveolar process. This is done after excising the subcutaneous mobile tissue, so that the bone is quite bare, or only covered by periosteum and the flap of mucous membrane is quite thin. After the healing we thus get a covering of thin, immobile mucous membrane on the alveolar process—we form a new higher alveolar ridge. We can fasten the flap to the bone in several ways: with small nails, with sutures, with a prosthetic appliance. By the second method the subcutaneous tissue, except the periosteum, is again removed from the side-plane of the alveolar process onto its crest and small Thiersch-grafts are transplanted from the arm onto the periosteum. They heal in the mouth very readily and give a good thin immobile substitute for the mucous membrane. We fix them onto the jaw after the method of Esser by placing the grafts on modeling compound with their external surface adherent. The raw-side of the grafts is pressed to the bone by suturing the modeling compound into the pockets of the reflected mucous membrane of the neighborhood, or by holding it in position with a prosthetic appliance, to which it is attached. Both methods can be combined, the first being the simpler for private practice. The second must be used, if the neighboring mucous membrane is in a bad state from scar formation, or is deficient in flexibility and size. In this way large areas of missing mucous membrane in the vestibular pocket, or the pocket between the tongue and the mandible, may be substituted as well. We have used these operative methods (a) in cases of jaw fracture and jaw defect for the healing of the fractures; (b) to substitute the contour of the face in cases of defect of the jaws; (c) to create a new vestibulum, if the mucous membrane has been destroyed; (d) for common but unfavorable prosthetic cases to enlarge the basis for the appliance. In cases of jaw fracture, especially of shot fracture during the war, strings of contracted unyielding tissue often unite the cheek or tongue with upper or lower jaw, not only hindering the opening of the mouth or the motion of the tongue, but with each movement of the mouth pulling a fragment of the broken jaw into dislocation. Therefore this fragment, for the healing of the fracture, has to be put at rest, by excising the scar and forming a new,

higher alveolar ridge covered with immobile mucous membrane, and a wide vestibular pocket, so that a prosthetic appliance can cover and grip the fragment well. In such cases these methods have been developed as well as in cases of bone grafts for pseudarthrosis of the jaw. They are used also to loosen fixed tongues. In cases where the chin or the middle part of the upper jaw is missing, we sometimes make a new deep vestibulum by transplanting Thiersch grafts, into which we put a prosthetic appliance that substitutes the missing part. In selected cases we use these operative methods to give to a partial or total prosthesis a better basis, a better hold. Especially in the lower jaw, the bony alveolar process that remains after the loss of teeth is often quite high, but the region of the immobile mucous membrane is very small. The prosthetic appliance has then no hold, or frequently produces ulcers by pressure. In all such cases one is able to give a better seat to the lower plate and to remove the pains. Sometimes at one place there may be only an attachment of muscle, or mucous membrane reaching onto the crest of the alveolar process, but this one string gives much discomfort and produces many complications and complaints.

One can use both methods, sometimes combined—the first for simpler cases; the second, if the surrounding mucous membrane is unfit or deficient. Besides, the second may be preferred because a flap might become necrotic. We do not think it advisable just to push the mobile tissue from the side plane of the alveolar process, and to put an extension of the prosthesis directly on the wound surface without covering it with new epithelium, because, in our first fracture-cases during the war, we saw that this procedure is insufficient if these cases are left to epitheliate from the neighborhood, and that the pain is great. In the upper jaw these operations are not so often indicated, and are limited to the buccal and labial sides.

59. INFLUENCE OF EXPERIMENTAL DISUSE ON THE PERIDENTAL MEMBRANE

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Molars on one side of the jaws of young albino rats have been extracted and the animals left alive for six months. The width of the

peridental membrane of the teeth without function became about half that of those in function. There is a biological width and a physiological width of the peridental membrane. The biological width is that which we find in teeth without function, and this is always less than the physiological width in normal functioning teeth.

60. REMAINS OF DECIDUOUS TEETH IN THE JAW OF OLD INDIVIDUALS

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In two jaws—one of a 64-year old individual, the other of a 58-year old person—remains of deciduous teeth could be found in the region of the lower bicuspids. The cementum and dentin had been partly resorbed, and bone had been deposited on the surface. The deciduous-tooth remainders had thus completely united with the surrounding bone.

61. INVESTIGATIONS ON THE EMBRYONAL PROGENIA

A. Martin Schwarz, M.D., Histological Laboratory (Director Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria

Twenty-five years ago A. Polzl, the anatomist, stated that in the second month of embryonic development the lower jaw is temporarily located before the upper jaw. The cause of this physiological embryonic progenia is the development of the palate in the following way: Originally the carum oris and the carum nasi are one, forming a common case. The upper half of that case is divided by the septum nasi. In the lower half is located the tongue. Septum nasi and tongue touch each other. On both sides of the tongue are the processus palatini. To give them the opportunity to connect in the middle, the tongue has to shift down. For that move it needs room. This is given by a transient forced growing of the lower jaw in length and breadth. Now the processus palatini are able to grow between the septum nasi and the tongue, subdividing the original common case in the carum nasi and carum oris. The statement of A. Polzl was based upon investigations on twenty-five embryoes of from 20 to 70

mm. in length. Bluntschli and Korkhaus have pointed out that, at birth, the lower jaw normally stands behind the upper one. This position is conformable to the purpose of sucking. Referring to both facts, the change in the growing of the mandible is not arbitrary, as some authors have asserted, but intimately connected with the contemporary development of the face and with the purpose of sucking.

It is an orthodontic question at what given time the embryonic progenia changes into the distal position of the lower jaw. To answer that question investigations have been made in 170 different fetuses of a body length of from 10 to 50 cm. The result was as follows: The change of progenia to the distal position of the lower jaw happens at very different times, usually at the end of the second month, occasionally somewhat later, and in a few cases progenia has been observed even at the time of birth. Such a persisting progenia is usually associated with a general underdevelopment. Clinical researches of such cases have shown that the progenia vanishes during the time between birth and dentition, the deciduous teeth standing afterwards in normal occlusion. Korkhaus has observed a suckling, the distal position of whose lower jaw was coincident at the time of birth, and who afterwards showed a typical progenia of the deciduous teeth.

From these observations we conclude that there is no etiological connection between the original progenia of the new born child and the typical progenia of the deciduous teeth.

62. PATHOLOGICAL VARIATIONS IN THE TEETH OF COLOBUS AND THEIR PHYLOGENETIC CONSEQUENCE

Harry Sicher, M.D., First Anatomical Institute (Director Prof. Dr. Tandler), University of Vienna, Vienna, Austria

The genus *Colobus* of the old-world monkeys of Africa lives exclusively on leaves and buds of certain trees. Its stomach and intestine are highly adapted to this food. Yet the big canine teeth, especially those of the male, embarrass the grinding movement of the lower jaw, although such food needs very thorough chewing. Therefore, the canines, especially the upper ones, after a short time, are worn to such a degree that the pulp cavity is exposed, with all the well known consequences. Besides, the canines are so weakened that they tend to

splinter. All the adult skulls present mutilated canines (and often also incisors), and all sorts of abscesses of the bone. These facts mean that *Colobus* is an example—and of all living animals the first—of an insufficient adaptation, namely the existence of big canines in a herbivorous animal. But some facts indicate that perhaps *Colobus* is now on the way to a better adaptation.

63. MULTIPLICITY OF SO-CALLED MIXED TUMORS OF THE SALIVARY GLANDS

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The tumors observed by the oral surgeon are the so-called mixed tumors of the salivary glands; also such as occur in the roof of the mouth, lips, cheek, orbita, and nose and throat cavities. Ordinarily the clinical picture of these tumors is a benign one, depending on slowness of growth and on strict delimitation on all sides. We know however, that in many cases—after a comparison of some authors (Wood, Kuttner) in from 25 to 28 per cent of the number—mixed tumors show an inclination to malignant growth. The reasons for this tendency are not known. Clinically it is possible to recognize malignancy only after it has set in. Therefore it is necessary to remove such mixed tumors. In most cases it seems that, with the removal of the mixed tumors, danger of malignancy is eliminated. But very often local relapses occur, which in most cases are as benign as the primary tumor. These local relapses arise from very small homogeneous additional tumors lying beyond the capsule, which were not taken away at the operation. Sometimes it happens that these additional tumors begin to grow simultaneously with the primary tumor not yet taken away. Then we have the picture of the multiple mixed tumor confined to one location, e.g., in the parotid gland. The multiple appearance of mixed tumors in locations that are locally separated is not well known. Regarding the so-called mixed tumors in this sense, I report the following:

A woman, 64 years old, was operated in February 1918 for the removal of a swelling the size of a child's fist in the right half of the roof

of the mouth. It had existed for three years. Histological examination showed the picture of a tumor epithelialis of the appearance of the common so-called mixed tumor of the salivary glands. In 1924 a tumor the size of a man's fist was removed operatively in the right fossa submandibularis. This swelling, defined by a thick connective-tissue capsule, was taken away easily, and histologically was the same as the first tumor. In 1928 from the same place once more was removed a swelling the size of a man's fist, which clinically was quite benign, and histologically was like the first two tumors. The patient has had no relapse. Doubtless this was a case of multiple occurrence of mixed tumors in the region of the head. Such cases are unusual and have been described only by Beale (a mixed tumor in each parotid gland), and by Wilson and Willis (mixed tumors of the glandula submaxillaris on both sides). Such cases support the opinion that these tumors were so-called fissural tumors, which may be caused wherever there has been a tie-off of ectodermic and mesenchymic germs by closure of the fissure embryonic.

64. HISTOLOGICAL INVESTIGATIONS OF THE PERIAPICAL REGION OF PULPLESS TEETH

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Fifty-four pulpless teeth from twenty-six different jaws have been investigated in their position in the alveolar bone. These investigations have been made with the intention to find how a process of healing could take place in the periapical lesions. Also it was aimed to get information on some histo-pathological questions currently under discussion. The best form of healing by osseous occlusion was seen in some of the slides. But in some cases various pathological processes have been found at the end of the foramina, while the chief canal showed an osseous occlusion. A connective-tissue capsulation of the apical foramen occurred, which is considered a satisfactory healing of pulp disease. We have also seen that certain types of cyst formation, particularly those that have an open communication with the pulp canal, may be considered as a mode of healing. But this form of healing can not be satisfactory because of the easy vulnerability of the epithelial layer. In the study of the specimens we found

that there are actually two types of cyst formation: one, a growing of epithelium along the surface of an abscess cavity; the other, as cavity formation within solid strands of epithelium. There is a difference between the forms of cyst in the fact that cysts which arise through cavity formation in epithelial strands are not in communication with the pulp canal, whereas cysts that arise in surrounding abscesses usually are in communication with the pulp canal.

Of fifty-four cases of pulpless teeth, epithelium was found in the periapical region in thirty-five. It is not known what happens there with epithelium, when the healing process begins, but the epithelium seems to be capable of extensive involution. Considering that the capsulation of the apex with connective tissue is preferable to healing in the form of a cyst, it seems that destruction of epithelium in the periapical processes is desirable. We are uncertain to what degree this can be obtained, yet we are of the opinion that the periapical tissue should not be spared in our methods of treatment. The persistence of extensive epithelium at the apex of the root prevents the appearance of a normally-wide peridental space at the apex, which in a successful treatment of a periapical process ordinarily is demanded.

Many authors try to find an explanation for the growth of epithelium in periapical processes. Almost nobody tries to explain why a certain number of periapical processes is found free from epithelium, although this fact requires an explanation because normally insulae of epithelium are found in the periapical region. Granulomata that are free from epithelium arise only when insulae of epithelium in the periapical region are destroyed to such an extent, during the acute inflammation, that afterwards there are no more epithelial cells to thrive under conditions favorable for the growth of epithelium. Ciliated epithelium was found in some cysts. In each of these cases, there was a communication with the antrum by a fistula.

65. CONNECTIONS BETWEEN METABOLIC DISTURBANCES AND PERIDENTAL LESIONS

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The diffuse atrophy of the alveolar bone (Gottlieb) is characterized by the loosening and migration of the teeth and an irregular downward

growth of the epithelium along the cementum. Clinical and histological observations indicate that this form of disease arises uninfluenced by local and mechanical conditions. Inflammations of the gums and the formation of pockets are of a secondary nature and do not belong to the real picture of the disease. Examinations of the metabolism of such patients have shown a series of abnormal changes. In about 90 per cent of the examined cases the specific dynamic effect of albumen was reduced. Further, it was observed that in a good many instances the contents of calcium, cholesterol, bilirubin, and sugar in the blood were increased. A pathological deviation in all directions could not be proved in all cases, but each showed *one* disturbance in some direction or other. So far it has not been possible to state any cause of these disturbances in metabolism, but it must be assumed that they change, above all, the circulation of the periodontal tissues.

The regular correlation of diseases of the jaw with disturbances of metabolism shows that the diffuse atrophy of the alveolar process represents the clinical sign of some internal disease. By the treatment of the diseased tissue with insufflated oxygen, not only the tissue itself but also the general metabolism is favorably influenced.

66. METHODS IN THE PLASTIC SURGERY OF THE CHEEK AND SIDE OF THE NOSE (TURNING AND RAISING THE LIP)[24]

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It is easily possible, in persons advanced in age, to cover big defects of the ala nasi, the side of the nose, and the cheek, by extensive plastic use of the upper lip, even if there is also a defect in the bone. The details of two new plastic procedures are shown in *figs. 8* to *10*. They allow a very quick restoration, and the patient accepts with resignation such an ideal cosmetic effect.

[24] Wolf: Ein Beitrag zur Wangen- und Nasenflügelplastik (Lippendrehung und Lippenhissung), *Archiv für klinische Chirurgie*, 1930, clx, p. 105.

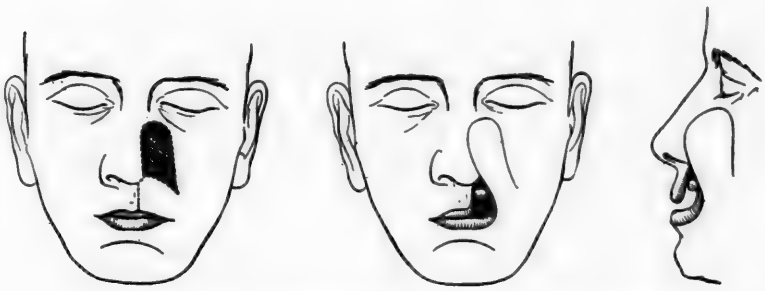

FIG. 8. First plastic procedure: *first* phase; turning the lip

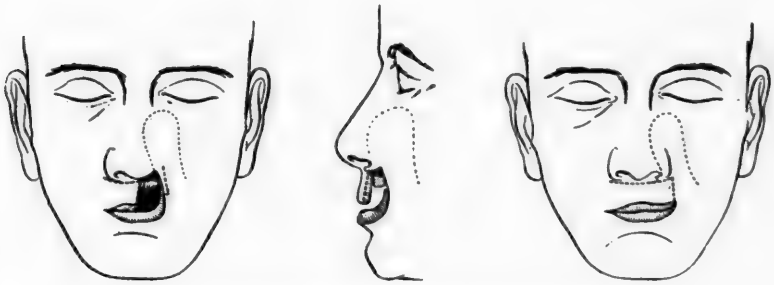

FIG. 9. First plastic procedure: *second* phase; turning the lip

Fig. 10. Second plastic procedure: raising the lip

B. CONTRIBUTIONS BY OTHER MEMBERS, AND BY GUESTS, WHO COULD NOT BE PRESENT: ABSTRACTS 67–80; SOME WERE AVAILABLE AT THE MEETING

67. THE DISTRIBUTION OF COLD AND WARM SPOTS IN THE MUCOUS MEMBRANES OF THE GINGIVAL, ALVEOLAR AND PALATAL SURFACES

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Thermal sensation was elicited by a metal applicator in light contact with the surface under investigation. When a thermal spot was identified its location was plotted on a dental cast of the subject. The distribution of cold spots was studied on three subjects; of warm, on five. The identity of the spots was repeatedly established. In the total area of 66.8 sq. cm. investigated, there were 5.4 cold spots and 0.3 warm spot per sq. cm. Densities of cold spots of approximately 10 per sq. cm. or greater were found in the anterior labial and anterior lingual-gingival areas, both maxillary and mandibular; also on the papilla incisiva and on the rugae. Warm spots are most numerous, 1 per sq. cm. or more, on the gingival area and on the rugae, where 15 out of the total number, 23, were found.

68. THE USE OF IODIZED OILS IN DENTAL ROENTGENOLOGY

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There are two uses to which iodized oils may be put in dentistry: to supplement the diagnostic wire now used, and to localize the seat of infection that causes fistulous tracts associated with the oral cavity. Dependence upon the diagnostic wire in root-canal therapy has always presented objectionable features. No matter how careful the operator, there is always the danger that the wire will pass through the apical foramen, penetrate the structures in the apical region, and introduce infection. Search to secure a safer method, and to eliminate the danger due to the diagnostic wire, has progressed sufficiently to indicate the possible substitution of a simpler technique, with a saving of time and a truer knowledge of conditions. Instead of the

diagnostic metallic wire as the agent whereby the roentgen ray is used to determine the length and configuration of the root canal, and to ascertain whether access to the apical foramen has been attained, superior results may be achieved with Lipiodol diluted with campho-mono-chloral-phenol.

Lipiodol is poppy-seed oil containing 40 per cent of iodine. The combination is such that iodine can be identified only by dissociation of the product. This vegetable oil with "dissembled metalloid" behaves as a fat when introduced into the body, where it is non-toxic. In the pure state, Lipiodol neither inhibits nor excites the growth of bacteria. By diluting Lipiodol with campho-mono-chloral-phenol, a germicidal quality is added to the solution, but its radiopacity is also reduced. A solution consisting of one part Lipiodol and two parts of campho-mono-chloral-phenol renders the solution extremely germicidal, but reduces its radiopacity to such an extent that it is of no value for diagnostic purposes. Sixteen parts of Lipiodol to one part of campho-mono-chloral-phenol have the desired qualities; that is, radiopacity and moderate germicidal power.

The technique for the insertion of Lipiodol into a root canal is extremely easy. After the tooth has been opened to afford excellent accessibility to the root canals, and the canals have been cleaned and opened, a cotton-point is saturated with the iodized oil, carried to the canal, and inserted. An excess of Lipiodol is placed in the pulp chamber, and with a slow pumping movement is worked into the canal as far as it would be possible to place a root-canal filling. It may be necessary to use more than one cotton-point, for in working it back and forth it becomes distorted. The tooth is then sealed, the roentgenogram made, and the patient dismissed without having to open the canal to remove a diagnostic wire. The special advantages of Lipiodol have already been mentioned, but bear repeating: It gives the operator the exact configuration of the root canal, and goes exactly where the root-canal filling material will go when inserted. When the patient returns for the next treatment the tooth is opened and the cotton-point removed. A dry point is then inserted in the canal and the excess of Lipiodol absorbed. The cotton-point is then removed, and the canal is ready for either further treatment or filling.

There are other uses to which Lipiodol may be put in dentistry.

For the location of perforated roots there is nothing better. The undiluted oil is pumped into the root canal as in preparing a root for filling; that is, by placing an excess of Lipiodol in the pulp chamber and with a saturated cotton-point forcing it into the canal, which is sealed with gutta percha. The roentgenogram reveals the path of the Lipiodol and shows the point of perforation. The examination of fistulous tracts, to ascertain the site of a focus of infection, requires a slight deviation in the technique for root canals. To force Lipiodol to the seat of infection, the oil must be injected into the fistulous tract. For this purpose an Iu Record syringe with a 2-inch needle is used. The needle, about a 21-gage, should have the sharp point removed, thus making a blunt-nosed needle, which, in place on the syringe, is passed through the fistula and into the fistulous tract until it strikes resistance, or the entire length of the needle is in the tract. The oil is then slowly injected. When the tract is filled, the oil runs out of the fistula. The needle is then withdrawn and the fistula closed with a cotton or gauze plug, thus preventing the oil from running out of the tract. A roentgenogram is then made, the Lipiodol appearing as a radiolucent area outlining the tract and leading to the source of infection. This applies not only to fistulas within the oral cavity, but also to those that are established after a gross lesion of the jaw. After injecting Lipiodol into a fistulous tract, the operator need not worry about its removal, for it is readily absorbed and is non-irritant.

Care of the needle. The syringe and needle should be sterilized in boiling water. The needle should never be flamed; combustion of the oil leaves particles of carbon in the lumen, and liberated iodine attacks the metal.

69. THE ELIMINATION OF ALL SOLDER JOINTS IN DENTAL BRIDGES

F. S. Meyer, D.D.S., Dental School, University of Minnesota, Minneapolis, Minn.

In order to cast bridges in one unit it was necessary to solve the problem of making accurate dies and their accurate transfer to plaster casts. Accurate impressions were taken by first casting closely-fitting silver trays to carry the impression compound. The amalgam dies were much improved by thoroughly triturating the amalgam and inserting

it into the impression by a system of jarring. Transferral of the dies to plaster models was accomplished by replacing the impressions on the abutments, taking plaster impressions of the teeth including the abutments, and then inserting the dies into these impressions while held in the plaster impression. The amalgam dies were coated with melted cocoa butter. When this was wiped off, no wax could thenceforth be made to stick to them even if melted on. The patterns for the abutments as well as the wax dummies were placed on the amalgam and plaster model. These were waxed together, leaving one opening between each two abutments. The whole model was then chilled in water to about 50°F, the waxing and sprueing completed at this temperature, and the wax bridge invested and expanded in water at 120°F.

70. DOES THE REMOVAL OF THE PULP *per se* RENDER THE PERIAPICAL TISSUES MORE SUSCEPTIBLE TO INFECTION?

J. L. T. Appleton, Jr., B.S., D.D.S., and William Pentz, B.S., D.D.S., School of Dentistry, University of Pennsylvania, Philadelphia, Pa.

The question stated in this title is one of the most fundamental in the whole problem of the pulpless tooth. The results here reported leave the question unsettled. This note is published to call attention to a method which, when extended to a sufficient number of animals and variously modified, may prove useful. Under general anesthesia pulps were aseptically removed from maxillary incisors of one side in three dogs. The canals were immediately filled with sterile gutta-percha. No antiseptics were used. Care was taken not to disturb the occlusal relations. The maxillary incisors of the other side were left untouched as controls. Four to six months later 5 cc. of a 20-hour Rosenow brain-broth culture from human periapical infection were injected intravenously. Within 24 hours the dogs were killed with chloroform, blood cultures taken (negative in all cases), the incisors roentgenographed (gutta-percha fillings proved to be satisfactory; no periapical radiolucency), and cultures taken from the periapical tissues of the pulpless and of the normal teeth. Results are summarized below:

Dog 1. Tooth operated on, $\underline{|2}$. Growth obtained.

Normal teeth cultured, $\frac{3, 2, 1}{3}\Big|\frac{1}{-}$. No growth obtained.

Dog 2. Teeth operated on, |1, 2. No growth.
Normal teeth cultured, 2, 1|. Growth obtained.

Dog 3. Teeth operated on, 2, | 1, 2. Growth in 2|. No growth in |1, 2.
Normal teeth cultured, 3, ,1 | , ,3. Growth in |3. No growth in 3, ,1|.

The inconsistencies in these results prevent conclusions relative to the question in the title. (Compare Wilkinson, F. C. 1929. *Australian Journal of Dentistry*, 33, pp. 211–6.)

71. CARE OF THE TOOTHBRUSH

Earle Lehmer, D.D.S., and J. L. T. Appleton, Jr., B.S., D.D.S., School of Dentistry, University of Pennsylvania, Philadelphia, Pa.

The number of bacterial colonies developing from a toothbrush which had merely been rinsed in running tap-water were determined. With this number regarded as 100, it was found, in comparative studies, (1) that rinsing in saturated aqueous sodium chlorid solution, immediately after use, reduced the number to 68 (average of 8 tests). (2) By liberally covering the toothbrush with dry sodium chlorid, immediately after use, the number was reduced to 35 (average of 9 tests). (3) Rinsing in Lugol's solution, immediately after use, reduced the number to 7.5 (average of 9 tests). (4) By working up a lather in the brush, with a soap (Tincture of Green Soap, Parke Davis Company's Germicidal Soap, Ivory Soap, or Life Buoy Soap) and then at once rinsing in running tap water, the number was reduced from 4 to 0.3.

72. THE EFFECT OF VARIOUS BASIC DIETS ON THE TEETH AND BONES OF THE ALBINO RAT. I. RATE OF GROWTH OF THE INCISOR

William G. Downs, Jr., D.D.S., A.M., Ph.D., Yale Medical School, New Haven, Conn.

Included as one phase of this larger series of studies, the author determined effects of high-protein, high-fat, high-carbohydrate diets and low-total-salt, low-phosphorus, and low-calcium diets on the rate of growth of the incisor teeth of rats. It was found that each of these diets had a decided and definite effect on such growth, the high-carbo-

hydrate diet stimulating growth the most; the high-protein less so, and the high-fat only slightly so. Each of the low-salt diets inhibited the rate of growth to about the same extent. The exact content of the diets and the methods employed are included in the complete paper.

73. A STUDY OF THE INCIDENCE OF DENTAL CARIES IN ONE THOUSAND CHINESE[25]

Bert G. Anderson, D.D.S., Medical School, Yale University, New Haven, Conn.

This study deals with the incidence of caries in individuals, in teeth and in tooth surfaces. Age, sex and geographical distribution of individuals were noted. The study seems to indicate that the incidence of dental caries decreases progressively as one travels from the port cities to the interior. This suggests that the incidence of dental caries may be directly proportionate to the extent of modernization in China.

74. THE LIPIN CONTENT OF THE DENTAL TISSUES IN RELATION TO DECAY[26]

Charles F. Bödecker, D.D.S., F.A.C.D., Department of Oral Histology and Embryology, Dental School, Columbia University, New York City

Fat has been demonstrated in the dentin by Weber, Hatton, Euler and Meyer, Orban, and others. Akamatsu has even traced it into the enamel. Its presence has been defined by using a specific stain such as Sudan III, Sudan IV, or osmic acid. The exact nature of the fats present in the dental tissues has not yet been determined; it is therefore better to consider them under the more comprehensive term of lipins or lipids. The distribution of certain lipins, made visible by specific stain, appears to be principally in those areas affected by dental decay and abrasion. It is the belief of the author, however, that lipins may be normally present in both dentin and enamel, and that they may protect the teeth of the adult against decay.

[25] This abstract extends the one on the same subject in the proceedings of the New Haven Section: *Journal of Dental Research*, 1931, xi, p. 235; April.

[26] Published in the preceding issue (April): *Journal of Dental Research*, 1931, xi, p. 277.

No one has realized the possible bearing a lipin that varies in quantity or character may have in reducing or increasing the incidence of dental decay. One condition protective of the teeth would be a comparatively high lipin content, which would tend to make the enamel and dentin almost impermeable to aqueous solutions. Thus mouth acids, which are always in watery solution, could not readily attack the teeth. Such a condition would explain the commonly observed reduction in the activity of dental decay after the age of 20 years. Before this time, when the enamel and dentin possess a high degree of permeability, the buffer power of the dental lymph may prove to be the determining factor in preventing decay.

75. A NEW VIEW OF DENTAL CARIES AND SOME OTHER DEGENERATIVE DISEASES BASED ON TIDES IN AVAILABLE ACTIVATORS AND THEIR RELATION TO BODY DEMANDS[27]

Weston A. Price, D.D.S., M.S., F.A.C.D., Cleveland, Ohio

The author approaches the problem of dental caries from a new viewpoint; namely, a study of evidences of nutritional disturbances originating in the soil and other factors which govern the plant growth eaten by the animals that produce the food for humans and the plants eaten by humans. By arranging the incidence of morbidity and mortality for a number of diseases in the order of occurrence by months, curves have been established which are very distinctly characteristic and have reproduced themselves from year to year. Other curves have consistently a phase opposite to the morbidity and mortality curves, and are related to the levels of the activating substances in foods. Since milk is the characteristic infant food of the mammalia, the level of the fat-soluble vitamins of this product has been most intensively studied. For this purpose milk, cream and butter, principally the latter, have been received, fortnightly, from many countries distributed throughout the world.

In addition to this correlation of opposite phases of the curves—the utilization of the fat-soluble activators from butters rich in activating substances (made possible by the diet of the cow)—these factors have been successful in reducing very greatly dental caries, practically

[27] To be published in the *Journal of Dental Research*.

controlling it, when administered in suitable amounts daily. These products are also used with very small amounts of cod-liver oil high in vitamin content. Many other degenerative diseases have been found similarly to be greatly lessened in severity.

76. NOTES ON THE HISTORY OF THE DISCOVERY OF THE CAUSE OF DENTAL CARIES, AND ITS PREVENTION[28]

J. Sim Wallace, M.D., D.Sc., L.D.S., F.A.C.D., Kings College Hospital, London, England

The author, after discussing the early work of Parmly (1818) and Robertson (1835), the recent work of Sprawson (1930) and others, and various matters bearing on the cause and prevention of dental caries, presented the following observations:

"(1) The enamel prisms are normally inorganic, and quite incapable of metabolising any matter which may surround them, whether this latter is lymph or keratin, liquid or solid, organic or inorganic, alive or dead. (2) Any real indication of vitality in the enamel is confined to spaces or tubes into which the living protoplasmic dentinal fibrils extend, which in the case of human enamel is only a microscopic distance. (3) There is a reaction to injury or irritation of the living dentinal fibrils which sometimes penetrates human enamel to a microscopic extent, but there is no evidence of vital reaction of the enamel itself. It is therefore misleading to speak of 'the form of vitality present in enamel.' (4) There is no known circulation of lymph (or keratin, which may be the trace of organic matter) in the enamel. (5) Afferent and efferent ducts or channels have not been differentiated, though perhaps vaguely assumed. (6) The organic content of the so-called lymph is devoid of lymphocytes, and unless hypothetical ultramicroscopic ameloblasts and ameloclasts exist in it, of which we have no knowledge or evidence, this 'lymph' is also non-vital. (7) Since human enamel can resist disintegration for thousands of years, *a fortiori* it can do likewise throughout the allotted span of life. (8) If cracks in human enamel can be repaired at all, it can only be by a cement substance of mesoblastic origin via or secreted by the admittedly living protoplasmic *dentinal* fibrils and independent of any

[28] To be published in the *Australian Journal of Dentistry*, beginning in April, 1931.

'vitality' of the enamel. (9) The analogy of tubular Marsupial enamel, in which are to be found living *dentinal* fibrils permeating two-thirds of its thickness, is no more relevant to questions with regard to the vitality of human enamel than cracks in the cementum of an elephant's molars are to cracks in human enamel. (10) For comparison, help and guidance, it would have been more appropriate to present illustrations of developmental laminae, especially since it is admitted 'that some linear translucencies are developmental in origin in human enamel.' (11) Other lamellae of developmental origin, and indeed all forms of 'defects' in fully formed enamel, persist without change throughout life, except as the result of the action of chemical or physical agencies. (12) Any appearance of reaction in the inorganic enamel, if not an error of interpretation, must be entirely due to living protoplasmic dentinal fibrils or other living protoplasm capable of deposition, or absorption and deposition of calcified matter. (13) Human enamel is incapable of initiating or completing metabolic processes even if supplied with or bathed in lymph, or any 'lymph-like substance.' (14) There is no 'immunity' to the action of acids on the surface of enamel even though acids may penetrate through it and possibly stimulate a secretion of calcium salts from the living *dentinal* fibrils, thereby causing an occlusion of permeable spaces which might retard the process. (15) Mr. Sprawson's further suppositions about metabolic changes in and around 'scars' resulting from cracks in human enamel need not be seriously considered. Scars, even in such a highly organic tissue as the skin, last all too plainly throughout life. The metabolic changes which he apparently would have us believe in, with regard to the much more highly specialized and inorganic human enamel, seem to be obliterated to such an extent that even under microscopic examination it is difficult to imagine that they ever existed.

"It may be said that these fifteen observations are all quite obvious, but why did Mr. Sprawson, in his recent communication, make such inferences as he did with regard to the vital reaction of enamel? Certain appearances were seen which can obviously and rationally be accounted for as the result of the vital reaction of the admittedly living protoplasmic *dentinal* fibrils. Why then should vital reaction be attributed to the 99.85 per cent inorganic human enamel together with such keratin or other paraplasm as apparently constitutes the

0.15 per cent of organic matter?" The author concludes that "the incidence of dental caries is purely a result of fermentative processes commencing externally to the enamel," and that further research should be conducted to provide "more exact knowledge of these processes, while the nature of the primary function of the saliva and the physiology of oral hygiene" should "be further elucidated and generally taught by physiologists and medical officers of health."

77. INVESTIGATIONS ON THE POSITION OF THE PULPLESS TOOTH IN THE JAW

Rudolf Weber, M.D., D.M.D., Dental Clinic, Cologne, Germany

The relations between the non-vital tooth and its surroundings have hitherto been treated exclusively from the standpoint of focal infection. This mode of dealing with the question is, no doubt, preeminently justified, for the non-vital tooth is a source of grave danger to the entire organism, since it harbors bacteria of all kinds. The following investigations proceed from another point of view. Their purpose is to ascertain whether, and to what extent, metabolic processes take place in the non-vital tooth, or what alterations occur in the hard structures of the tooth when the pulp is removed. There are already on record the results of diffusion experiments, with the tooth removed from the jaw, which show that the non-vital tooth behaves like a battery cell when it is suspended like a separating membrane between two fluids. This can under no circumstances be assumed of the vital tooth. Although the enamel must be regarded as a limiting surface system with reference to the saliva, and although complicated physico-chemical processes do take place at its surface, nevertheless, we may assume, so far as the vital tooth is concerned (in spite of Entin's work), that there is no diffusion of tissue fluids from the pulp to the saliva, or vice versa. According to our findings, the changes that occur in a tooth left in the jaw after the pulp has been removed must be considered from the standpoint of autolysis. They all have the characteristics of protein decomposition. This can be demonstrated by placing the freshly extracted tooth into physiological salt solution (which might be called the "survival test"), and within a few days determining the output of ammonia, which is an end-product of protein metabolism and may serve as an indicator of necrobiotic

processes. In this way we found that teeth with a necrotic pulp (pulp gangrene) gave the highest values for ammonia. The autolysis of such teeth is also favored and increased by the putrescent contents of the root-canal.

These results raised the question: How does a tooth behave when the pulp is removed "strictly according to rules" and the root-canal filled with an "antiseptic" filling? A number of teeth of several dogs were treated in an effort to answer it. In carrying out the root-canal treatment thoroughly, it was found that the teeth chiseled out of the jaw eight weeks after the operation gave off only traces of ammonia. This result indicates that by thorough root-canal treatment the protein substances of the teeth (hence of the dentin) had been *fixed*, i.e., converted into a condition that no longer permitted autolysis.

The succeeding paper on fatty changes demonstrates that they are particularly marked in a tooth with putrescent pulp. The decomposition of protein passes through stages in which fat becomes visible. In such teeth the protein decomposition is greatest, and therefore the ammonia values highest. Possibly toxic products of protein autolysis pass from the body of the tooth into the surrounding connective tissue of the jaw. This process may take place so slowly that no cellular reactions occur in histological sections. However, one should always bear in mind that such reactions are possible. In the treatment of the pulp, care should be taken to make the tooth an indifferent foreign mass that does not give off to the body any products of the autolytic processes that set in after death of the pulp. Investigations on the question whether the non-vital tooth actually gives off such substances are still in progress. Only biological experiments can solve this problem.

From the standpoint of dentistry it is important to know whether the drugs introduced into the root canal filter through the body of the tooth into the connective tissue, or whether the non-vital tooth absorbs and stores these drugs. This has been tested with arsenious oxide. Even three weeks after the application of the drug (which was allowed to act on the pulp for two days only, whereupon the pulp was at once removed) there was still a distinct arsenical mirror in the Marsh test. Since these investigations, and similar ones by other methods, have not yet been completed, a final conclusion can not be

reported. The results indicate tentatively that drugs applied to a non-vital tooth remain in it for a long period. The routes by which the transmission takes place will not be discussed before unequivocal results have been obtained. I hope to be able to report on this more explicitly at the next meeting.

78. HISTOLOGICAL INVESTIGATIONS ON THE OCCURRENCE OF FAT IN THE TOOTH

Rudolf Weber, M.D., D.M.D., Dental Clinic, Cologne, Germany

Previous investigations on the occurrence of fat in the odontoblastic processes of the dentin were continued on 230 teeth. The purpose of the study was to ascertain whether the regressive and inflammatory alterations in the pulp are concurrent with morphologically invisible changes in the hard structures of the teeth. We know that throughout life the pulp undergoes various regressive changes (calcareous, connective-tissue degeneration, atrophy, etc.). It may naturally be assumed that with the lowering of the oxidative processes in the pulp there will also be changes in the quality of the hard structures. As to histological method, there is only one procedure, namely the staining for fat with Sudan III. It is a well known fact that with lowering of the oxidative metabolic processes fat occurs in increased amounts in the tissues. The investigations yielded the following results:

In teeth devoid of inflammatory changes of the pulp (atrophy, degeneration, etc.), the nutrition is impaired in the odontoblastic processes and with them in the dentin. Consequently fat is found in the odontoblastic processes in the area adjacent to the pulp changes. Generally the fat is limited to the inner third of the dentinal wall. In the case of a suppurative inflammatory pulp, that part of the dentinal wall adjacent to the inflammatory focus generally shows pronounced fatty changes. These are particularly marked when putrescent decay of the pulp has taken place. In the first group the fatty changes may be attributed to disturbances of oxidation, inasmuch as previously supplied fat is no longer burned up and appears in visible forms. In the second group, the fatty changes in the odontoblastic processes are due to direct injury by the catabolic products of the pulp. These pass into the odontoblastic processes and, through degenerative influences, lead to fatty changes, for the decomposition of protein passes through phases in which fat becomes visible.

Something similar occurs in caries; the odontoblastic processes within the carious area undergo fatty changes. Also this is a degenerative process and is due to the toxins of the bacteria of caries. When the dentin is exposed by attrition, the odontoblastic processes undergo fatty changes in the involved area, the process almost extending to the pulp. This, too, is due to toxic causes. Because of the loss of enamel, saliva reaching the dentin may act as a tissue poison. These results with the fat-stain indicate that the vital quality of the hard structure of the tooth is injured through degenerative or inflammatory changes in the pulp.

79. DENTAL INFECTIONS: COMPARATIVE SYSTEMIC EFFECTS OF QUANTITATIVE APICAL CHANGES[29]

Daniel E. Ziskin, D.D.S., Dental School, Columbia University, New York City

A study was made of 1503 full-mouth x-rays to determine whether there was a correlation between the findings, as noted in the x-rays, and the systemic condition. The patients attended the Dental Clinic of the Minneapolis General Hospital. The x-rays were taken routinely of patients from the wards (bed patients) and from the out-patient department, and of patients coming for dental treatment only, as referred by various social and charitable organizations of the city. The patients from the wards and the out-patient department were diagnosed as to their systemic condition by the medical staff in attendance at the hospital. The others had no systemic complaints. The patients having systemic diseases were grouped as follows: (1) *Plus group:* patients having systemic diseases attributable to focal infections (arthritis, neuritis, asthma, etc.) (2) *Minus group:* patients having systemic conditions not attributable to focal infections (skull fracture, fracture of long bones, syphilis, tuberculosis, pregnancy, etc.) (3) *Plus-minus group:* patients having systemic diseases that may or may not be attributable to focal infections (neurasthenia, bursitis, chorea, endocarditis, nephritis, iritis, gastric ulcers, etc.). (4) *Dental (control) group:* patients having no systemic complaints.

The x-rays were grouped as follows: *Group 1:* full-mouth x-rays;

[29] Published in the preceding issue (April): *Journal of Dental Research*, 1931, xi, p. 285.

one or more pulpless teeth showing large rarefied areas. *Group 2:* full-mouth x-rays; one or more pulpless teeth showing small rarefied areas. *Group 3:* full-mouth x-rays; one or more pulpless teeth having no apparent rarefactions. This is the x-ray negative group. *Group 4:* full-mouth x-rays; pulpless teeth containing combinations of rarefaction and apparently negative areas. *Group 5:* full-mouth x-rays; no pulpless teeth present. This group is used as a second control. *Group 6:* full-mouth x-rays; one or more pulpless teeth showing areas of bone condensation. This group was so small, that it was not a factor in the comparison, and is not listed.

The comparisons were made in two ways: *First:* the large rarefied-area group was distributed into the dental, plus, minus, and plus-minus groups. The same distribution was given to groups 2, 3, 4, and 5. *Second:* the dental (control) group was distributed into the large rarefied-area group, small rarefied-area group, negative group, etc. The same distribution was given to the plus, minus, and plus-minus groups. Both comparisons showed slight differences in the percentages of the various groups. For example: the plus group contained 10.19 per cent of the large rarefied areas; 13.11 per cent of the small rarefied areas; 13.4 per cent had no apparent rarefactions; and in 12.31 per cent no pulpless teeth were present (control). The large rarefied-area group contained 43 per cent having no systemic complaints (control); 33.87 per cent had diseases of possible focal-infective origin (plus); 40.47 per cent were definitely non-focal infective in origin (minus); in 45.79 per cent the origin as to focal infection was uncertain (plus-minus). In these comparisons no more importance can be attributed to one type of pulpless tooth than to another. There is no constancy in the frequency with which large rarefied areas appear about pulpless teeth in connection with any disease group. The same applies to teeth that are negative in the x-ray. We also find comparable frequences of pulpless teeth in healthy as well as diseased individuals.

These findings indicate that the dental x-ray, as related to this study, is useful only in *locating* pulpless teeth. We cannot select, from several pulpless teeth in a mouth, those that are harmful and those that are not. We must rely upon other evidence than that of the x-ray in forming judgments as to when to extract pulpless teeth.

If extraction is decided upon, then all pulpless teeth are in the same category, the only exception being that strategic teeth may be allowed to remain, even though pulpless, for often the discomfort caused by the extraction of all teeth may be more difficult for the patient to bear than the disease from which he seeks relief. The x-ray cannot indicate the systemic pathological significance of any pulpless tooth.

80. NOTES ON THE RÔLE OF BACTERIA ABOUT THE NECKS OF TEETH

Robert A. Keilty, M.D., Washington, D. C.

Gingivitis is used by the author as an inclusive term to mean all types and characters of inflammatory change in the soft structures and bone about the necks of the teeth. The term is offered not to confuse but to simplify. The bacterial flora, with certain types predominating, is given the prime etiological rôle as the cause of this gingivitis. Such other factors as traumatic occlusion, collection of tartar, calcium-phosphorus imbalance, and lowered resistance, are all considered important but contributory factors. The infections now described as acute Vincent's disease and pyorrhea are brought intimately together under the one heading of gingivitis, classed and treated on the basis of their bacteriology. This meets the requirements of the pathology of inflammation.

IX. Data of Executive Proceedings

A. Lists of the officers, and new members, elected[30]

a. Officers (1931–32)

President—A. E. Webster, University of Toronto. *President-elect*—R. W. Bunting, University of Michigan. *Vice-president*—E. H. Hatton, Northwestern University. *Treasurer*—William Rice, Tufts College. *Secretary*—William J. Gies, Columbia University.

b. New members

R. Gordon Agnew, B.A., D.D.S., L.D.S., Professor of Dental Pathology, West China Union University, Chengtu, Szechwan, China

[30] Lists of the officers and members, as of December 1, 1930, were published in the *Journal of Dental Research*, 1930, x, p. 784.

Peter J. Brekhus, B.A., D.D.S., Professor of Crown and Bridge Work and Oral Diagnosis, College of Dentistry, University of Minnesota

B. Holly Broadbent, D.D.S., Director, Bolton Study of the Development of the Face of the Growing Child, Western Reserve University, Cleveland, Ohio

Robert Kennard Brown, M.S., D.D.S., Professor of Operative Dentistry, School of Dentistry, University of Michigan

William Lincoln Fickes, D.D.S., F.A.C.D., Professor of Hygiene and Ceramics, School of Dentistry, University of Pittsburgh

Guido Fischer, D.M.D., Ph.D., Director, Dental Institute, University of Hamburg, Hamburg, Germany.

Albert Borden Haverstock, D.D.S., B.Sc., Lecturer and Demonstrator in Pre-School-Age Dental Clinic, Dalhousie University

Otto Loos, M.D., Director of the Dental Institute ("Carolinum"), University of Frankfort, Frankfort a/M, Germany

Francis P. McCarthy, M.D., Professor of Oral Medicine, Dental School, Tufts College

Emanuel George Meisel, D.D.S., F.A.C.D., Assistant Professor and Head of Departments of Clinical Dental Pathology and Radiology, Dental School, University of Pittsburgh

Henry A. Miller, B.A., D.D.S., Fellow in Oral Pathology, Medical School, Yale University

Harold J. Noyes, Ph.B., B.S., D.D.S., Orthodontist, 30 N. Michigan Ave., Chicago, Ill.

George C. Paffenbarger, D.D.S., Research Associate of the American Dental Association, National Bureau of Standards, Washington, D. C.

Weston A. V. Price, D.D.S., M.S., F.A.C.D., Director, Laboratory for Dental and Nutritional Research, Cleveland, Ohio

Isaac Schour, B.S., M.S., D.D.S., Assistant Professor of Histology, Dental School, University of Illinois

Warren R. Schram, D.D.S., M.S.D., 1210 Lowry Medical Arts Building, St. Paul, Minn.

William Timothy Sweeney, A.B., Junior Physicist, National Bureau of Standards, Washington, D. C.

Norris Onslow Taylor, Ph.D., Research Associate of the American Dental Association, National Bureau of Standards, Washington, D. C.

Francis Bulkley Vedder, A.B., D.D.S., Associate Professor of Crown and Bridgework, School of Dentistry, University of Michigan

Harold F. Wahlquist, B.C., D.D.S., M.B., M.D., 835 Medical Arts Building, Minneapolis, Minn.

John J. Wolfe, L.D.S., D.D.S., Fellow in Oral Pathology, Medical School, Yale University

James L. Zemsky, D.D.S., Attending Oral Surgeon, Midtown Hospital, New York City

Total number of new members, 22

Total membership (May 24, 1931), 243

B. NAMES OF MEMBERS PRESENT AT ONE OR MORE SESSIONS

(Arranged in sectional groups)

Ann Arbor.—Brown, Bunting, Lyons, Rickert, Ward. *Boston.*—Rice. *Chicago.*—Boulger, Davis, Hatton, Kronfeld, Noyes (F.B.), Skillen. *Cleveland.*—Chase, Hill. *Halifax.*—Thomson. *Minnesota.*—Brekhus, Waldron. *New York.*—Clapp, Gies, Palmer, Waugh. *Philadelphia.*—Cook, Prinz. *Pittsburgh.*—Dewey, Friesell (F.C.), Friesell (H.E.). *St. Louis.*—Wheeler. *Toronto.*—Webster. *Not yet members of a section.*—Agnew (Chengtu, China), Beust (Louisville), Bryan (Iowa City), Klein (Baltimore). *Total.*—32.

At each session there was a large attendance of guests, many of whom, as members of dental faculties, also attended the coördinated sessions of the American Association of Dental Schools, March 23–25, in the same hotel.[31]

[31] See the footnote on page 437.

"DENTAL JOURNALISM"—CONTRA[1]

BISSELL B. PALMER, D.D.S., F.A.C.D.

New York City

In the April 1931 issue of the *Journal of the American Dental Association* appeared an editorial entitled "Dental Journalism."[2] This editorial is a comment on the article entitled, "The Present Status of Dental Journalism; the Rôle of Editorial and Advertising Policies in the Campaign for Reform of Proprietary Dental Advertising," which appeared on page 644 of the same publication. The Editor states that he is not disposed to enter into controversy on the points at issue, but hopes instead to bring about "a slight clarification that shall be helpful to all." The present writer, although welcoming this purpose, feels that the editorial not only failed to clear up the questions under discussion, but actually befogged them.

The epitome of my article by the Editor is almost correct, for he sums up its context as being an exposition of "the baneful influence on the profession of so-called 'trade journalism'; and the present unfortunate condition of our own official organ with reference to its editorial and advertising policies." The Editor's reference to "other various and sundry reflections which have been unceremoniously dragged into the open for pious ventilation in the attempt to reform and revolutionize the entire fabric of dentistry with one fell swoop," is an unjust one for it cloaks my frank exposition of *some* of the *correctable* deficiencies of dentistry with a sanctimoniousness that was neither apparent in the article, nor intended in its writing. It is not an

[1] This reply was presented to the Editor of the *Journal of the American Dental Association*, for early publication in that *Journal*, but was returned to the author for the stated reason "that the topic has been discussed sufficiently already" [*B. B. P.*]. The reply is published here at the request of the Commission on Journalism of the American College of Dentists, and with the Commission's knowledge of these circumstances. The manuscript was received after the date at which this number was closed, but in time to be presented as the concluding article.—[*Ed.*]

[2] The editorial under discussion is reprinted as an Appendix to this reply (pages 550–552).—[*Ed.*]

uncommon procedure for those who desire for any reason to defend interests contrary to the public good to cry out "reformer," "holier than thou," "sanctimonious," "pious," etc., with the idea of exciting prejudice against the arguments of those who would change an old order for a better one. Obviously such expressions do not constitute argument, and do not clarify an issue.

The Editor asks the question, "Is it true that trade journalism is such a hydra-headed monster as we have been led to believe?" and then proceeds to a retrospection of the earlier days of dentistry. The evils of trade-house journalism are well known, and little disputed except by those who are now, or who have been in the past, beneficiaries of its system. When the Editor of the *Journal of the American Dental Association* suggests doubt that trade-house journalism in the dental profession really deserves the criticism of those who have denounced it, and conveys a contrary implication, he answers with a stroke of his pen some questions that have perplexed those who are striving for higher standards for the dental profession. It is obvious that neither trade-house journalism, nor any of the other demoralizing relics of the primitive days of dentistry, will be eradicated until we place in our influential positions of trust and responsibility only those who are sensitive to our deficiencies, and who are proud enough of dentistry and its potentialities to wish to correct them.

The question is raised, "What about the days long before the establishment of any of our independent journals?," the Editor evidently failing to realize that there were almost no dental days before the establishment of our first independent journal, the *American Journal of Dental Science*, which preceded all of the trade-house journals. There can be no question that, in disseminating dental literature, the periodicals published by the trade houses served a useful purpose in their day. However, to oppose supersedence of these periodicals today by independent publications, on the ground that it would be a lack of gratitude, is unwarranted and illogical. The proprietary schools in dentistry also served an important purpose at a time when there were not sufficient university schools to meet the profession's needs. On the other hand, when the profession became aroused against commercialism in dental education, about the only ones who criticized the attempts to correct conditions were those who had been the benefi-

ciaries of the system. Today there are no proprietary dental schools in the United States, and where is the man who is stupid enough or brave enough to suggest bringing them back? Dental journalism is an important branch of dental education. We cannot reasonably have one main part of dental education commercial, and another main part non-commercial.

A misplaced sense of gratitude should not impede a much needed improvement in the journalism of our profession. I am not unmindful of the fact that, in the earlier days of our profession, the trade-houses published literature that was in itself beneficial to the profession. On the other hand, it is obvious that in this they were not impelled by any philanthropic motive. The Editor's statement that there would have been no early dental literature without the trade journals is open to serious question, for the pioneers of dentistry who had vision and courage enough to carry on over so many other obstacles would undoubtedly have met the journalistic problem as well. As a matter of fact, numerous independent journals were launched. It is entirely probable that if the trade houses had not overcome competition from the independent journals, by publishing journals that yielded so much profit from associated advertising matter that the subscription prices could be kept very low, the profession would have supported its own periodicals, and our journalism today would be on a much higher plane. I do not agree with the Editor that trade-house control of a profession's journalism *can* be "worthy" of any *profession's* "best traditions."

Contrary to the implication contained in the editorial, no indication of an effort "to besmirch the names of some of the noble men of the past" appears in my article. The opposition that we are currently forced to overcome (such as that in Dr. Johnson's editorial), when we attempt to advance the ideals of our profession, would alone cause me to sympathize with the "noble men of the past" who were engaged, under even greater difficulties, in efforts to dignify and advance the dental profession. Building straw men, and then bravely knocking them down, does not convince thinkers who are interested in facts.

I challenge the statement made in the editorial that it reflects on the ethics of equity and propriety for me "to speak in these latter days of indulgence in a sort of 'free lunch' type of journalism, and what

amounts to almost a system of racketeering in connection with the financing of our large conventions." I justify the "free lunch" statement by comparing the "philanthropy" of dental trade-houses which either actually or practically give away a dental periodical to those who purchase their goods, with the "philanthropy" of the café owners of other days who gave away luncheon to customers who purchased their goods. My statement, "almost a system of racketeering," will also stand up under analysis. In substantiation of it, the suggestion is made that members of the American Dental Trade Association be asked if they have not felt for years that they were forced by circumstances to pay what they considered to be exorbitant rates to the important dental conventions for exhibit space. Inquire if rebellion did not finally show itself at the Denver meeting of the American Dental Association in 1930 when the American Dental Trade Association, consisting of the strongest and most influential dental manufacturers in the country, refused to meet the demands of the American Dental Association, and consequently did not exhibit their goods at that convention. With these thoughts in mind, and recalling that "racketeering" is a system whereby one who does not wish to do so is forced by fear of more serious consequences to pay more for goods or services than he believes they are worth, consider whether my statement is either untrue or improper.

The Editor is in error in his terminology when he refers to "practices that have crept into journalism and into dental associations." The malicious practices referred to in my article have not *crept* in, they have *forced* themselves in, and not as recently as the Editor's statement implies. The charge that I cry "Wolf! Wolf!" is not appropriate, for in the time-worn story this cry was repeatedly raised when there was no occasion for it, and surely even the most complacent would not consider that there is no reason today to raise a voice of warning to the dental profession about trade-house journalism. If the editorial pages of our official journal had raised more cries of warning to our profession through the past decade, we would probably be farther along toward our developmental goal today.

I deny the charge that my article constitutes "muck-raking" which, as the Editor points out, is not constructive. My article was entirely constructive, and for every criticism found in it there will also be

found a corrective recommendation, including many suggestions for the improvement of the *Journal of the American Dental Association.* In consequence, this unfair charge must fall of its own weight.

The statement made by the Editor that the *Journal* is unreservedly on the side of independent journalism may be the truth, but it is probably not the whole truth, for how can one be sincerely an advocate of independent journalism, and at the same time a defender of the journalism owned by the dental trade-houses, and published by them in their own interests, and not as they would have us believe "in the interest of the dental profession." One could have as logically stated that he was unreservedly an advocate of university teaching in dentistry, but that on the other hand the commercial schools were not as bad as they were painted, and thus lull to sleep again a profession that was being aroused to the importance of eliminating commercial dental schools. The weak pledge of the *Journal's* allegiance to the cause of independent journalism is made to appear still weaker when the Editor attacks the personal principles, and the motives, actuating one who has devoted nearly twenty years of effort to the furtherance of that cause.

The assertion that my article advocates "ungraciously biting the hand that has been feeding us" will deceive no one. It is perfectly true, as the Editor knows, that the hands of the dental trade-houses have been feeding a few chosen ones in the profession. Nevertheless, a careful reading of the financial statements of the most important dental manufacturing companies indicates that they have made tremendous profits on their original capital stock. Therefore, I challenge Dr. Johnson to argue away, on any basis, my flat assertion that the hands of dentists are the ones that have been supplying the sustenance, and the dental trade-houses have been the ones that have been doing the feeding. However, even if this were not so, and the Editor's contention were correct, it must be remembered that even a child grows up to the point at which it no longer requires feeding. If, at that point, he should insist upon feeding himself, can he justifiably be called an ingrate?

I am in complete accord with the statement that dentistry like all other growing organizations must walk before it can run. But our profession should realize that, having reached a certain stage of develop-

ment, *it has stature*, and that therefore it is humiliating to the profession to continue to "crawl" or toddle along with the guidance of a sort of trade-house nurse-maid.

I do not agree that there is evidence of "*frantic*" advocacy of a militant policy in my article. On the other hand, I have maintained and still do that a militant policy on the editorial pages of our official journal, on the many important questions affecting the dental profession, would accomplish results at least equal to those that have been achieved, for the medical profession, by the institution of such a policy on the editorial pages of the *Journal of the American Medical Association*. I believe further that a complacent musing about the beautiful spring, the delightful vacation time, the sunniness of sunshine, and similar subjects, will not solve dentistry's problems.

When the Editor suggests that, on the issues treated in my article, the attitude of some of us (undoubtedly including the present writer) is "ridiculous," I would raise the question whether he realizes that the advertisement policy in the pages of the official organ of the American Dental Association has made the dental profession look ridiculous? Even a casual perusal of the advertisement section of the current issue will make my meaning clear. If one individual or another looks ridiculous that is unfortunate; but if an important profession is made to look ridiculous, that is a catastrophe!

In no place in my article will be found, as asserted by the Editor, any advocacy of the policy of tearing down faster than we can build up. In this connection it may be of interest to point out that the Reports of the American College of Dentists' Commission on Journalism, of which I have the honor to be chairman, clearly point out the wisdom of building up the new before we tear down the old. Obviously we must engage in a constructive effort to increase the capacity of our independent dental journals to such a point that we can publish in dignified professional periodicals all the worth-while current literature of dentistry. In view of the fact that the Editor must be acquainted with my views as stated in these Reports, it is surprising that he should misstate my known position in this matter. The writer strongly advocates evolution and not revolution in the solution of the problems of dentistry, but he also believes that evolution should not always be viewed as a process that may be deferred to the remote future.

The Editor has credited me with an implication that is not justified by a careful reading of my article. He states that I have suggested that there is a place for the "inspirational" in dental literature. While this is so to a degree, my stated position was clearly in reference to the policy of the Editor in wasting the limited editorial pages of our *Journal* in "Pollyanna" pennings regarding platitudes and other matters of general acceptance, when those same pages could be effectively used to further important causes in dentistry. The Editor fails to note that there are subjects other than scientific and inspirational. Thus, he disregards the fact that there is a need for editorials of an educational type, written for the purpose of promoting advancement of the public welfare and of the dental profession. My only objection to inspirational articles in the *Journal* is their use of the space that is so urgently needed for important messages. I have not advocated nor do I suggest that the pages in the main part of the *Journal* be filled with articles relating only to pure science. On the other hand, I disagree with the Editor's belittling remark that there is not enough of such material to fill the pages, and that if there were enough it would never be read. The first opinion does not take into consideration the fact that at a meeting of but one dental organization, the International Association for Dental Research, in Memphis, Tenn., in March 1931, nearly eighty important research papers were presented. The research reports delivered at the sectional meetings of the Association held throughout the year add greatly to this total. Regarding the second remark, while it may be true that "old-school" members of the dental profession are not interested in and would not read such material, I believe that the Editor has not taken into consideration the fact that the more recent graduates in dentistry have a keen and growing interest in scientific articles. Dr. Johnson, in discussing the point that some published findings of "research" have been unfounded, made the statement that "many of the facts that we have found out are not so." His criticism of my article might be appraised in a somewhat similar vein.

I agree with the Editor that we should strive for balance in our deliberations and in our literature, and that we should be generous, charitable and consistent, but balance does not mean acceptance of an unbalanced or one-sided situation. I maintain also that we should

primarily concern ourselves with dentistry's current requirements; that we should have courage in expressing them; and that we should have a modern vision of the profession's obligations and opportunities, all of which have nothing to do with personalities.

The writer denies that he has pursued "the foolish policy of advocating a lot of measures that are wholly impractical just because . . . . [he has] become obsessed with an itch for criticism based on ignorance of the real essence of the situation or the real needs of the profession," and challenges Dr. Johnson to point out the existence of such a policy. I have become imbued with the desire to see the profession chosen by me, and by my father before me, for a life's career, throw off the shackles that have bound it to commercial influences, and which subject the profession to serious and justifiable criticisms. I offer my two-year intensive study of American dental periodicals, under the auspices of the American College of Dentists, following eighteen years of continual attention to the subject of dental journalism, as answer to the charge that I am ignorant of the situation itself, and "the real needs of the profession."

For the first time in fifteen years the question of independent journalism versus trade-house journalism in dentistry has come up for wide discussion. I am confident that there are now enough professionally minded members of the profession to make it possible to overcome the opposition that the supply-houses, their supporters, their supportees, and certain misguided dentists have raised, and will continue to raise, against the effort being made to advance the ideals of our profession. The lines are forming, and the hour is at hand for a mustering of the forces that are dedicated to a further elevation of the standards of dentistry!

667 Madison Avenue

APPENDIX

"DENTAL JOURNALISM"[3]

"In the current issue of the *Journal of the American Dental Association,* there is an article on page 644 entitled 'The Present Status of Dental Journalism; the Rôle of Editorial and Advertising Policies in the Campaign for Reform of Proprietary Dental Advertising.'

[3] Reprinted from the *Journal of the American Dental Association,* 1931, xviii, pp. 735–38; April.—[*Ed.*]

"While it is usually not our custom to comment editorially on topics presented in our reading pages, the pointed references in this article dealing with the policy of our own *Journal* make it incumbent on us to take brief cognizance of the matter at this time. We have no disposition in the least to enter into a controversy on the points at issue, but we venture to hope that there may be a slight clarification that shall be helpful to all.

"To epitomize the contentions made by the writer of this paper they may be summed up as follows: The baneful influence on the profession of so-called 'trade journalism'; and the present unfortunate condition of our own official organ with reference to its editorial and advertising policies; together with other various and sundry reflections which have been unceremoniously dragged into the open for pious ventilation in the attempt to reform and revolutionize the entire fabric of dentistry with one fell swoop.

"In the language of one of our noted men, 'Let's reason the thing a minute.' In the first place, is it true that trade journalism is such a hydra-headed monster as we have been led to believe? What about the days long before the establishment of any of our independent journals? Is it not pertinent to remark that those early trade journals produced a periodical dental literature that was in every way worthy of our best traditions? Without them, there would have been no literature at all, and shall we have the temerity to contend that it were better to have none than to have the literature we possessed for nearly half a century? It rests with ill grace to besmirch the names of some of the noble men of the past who have contributed honor and dignity to the editorial councils of the profession in those days; as it also reflects on the ethics of equity and propriety to speak in these latter days of 'indulgence in a sort of "free lunch" type of journalism, and what amounts to almost a system of racketeering in connection with the financing of our large conventions.'

"We hold no brief for some of the practices that have crept into journalism and into dental associations. As with every other enterprise under the sun, there are certain ulterior influences that cannot be condoned, but it is a far cry for some of our critics in the profession—and out of it—to shout 'Wolf! Wolf!' and make intemperate insinuations about racketeering. It savors too much of that reprehensible practice of muck-raking, and muck-raking in professional life is not a creditable thing; it tends neither to constructive reform nor to propriety.

"It need not be stated that as far as our *Journal* is concerned, we line ourselves unreservedly on the side of independent journalism. By predilection and in principle, we are manifestly whole-heartedly in favor of it, as must be too apparent for any quibble. It is the very bone and sinew of our

professional faith, and we hope to see it grow abundantly in stature and in grace. It is not saying too much to state that we are devoting the very best energy of our existence to its constructive development and we are proud of every advance that is recorded; but this does not imply that we are justified in superciliously turning our back on the past, or in ungraciously biting the hand that has been feeding us.

"Dentistry considered in the light of its organizations and particularly of its independent periodical literature is young in years and more or less limited in its traditions. It cannot run before it walks, and there is grave danger that in the frantic advocacy of the 'militant' policy so greatly beloved of our critic, the net result will be more quixotic than constructive. There is too great a tendency to tilt with windmills in some of our attitudes and to merely make ourselves look ridiculous. We may easily do more harm than good by our sensational straining for effect; and the practice of running amuck with our criticism may ultimately prove our undoing.

"We think that we can logically claim a steady improvement in the character of our journalism. Of necessity, it must be of gradual evolution lest the 'growing pains' to which reference has been made turn out to be a fatal malady. Let us not tear down faster than we can build up.

"As to our editorial policy, we are grateful for one concession. While rather grudgingly given, there is still an implied acknowledgment that some of the 'inspirational' is needed in our literature. In other words, it cannot be all science. It cannot be for two very good reasons; first, because there is not enough of original, authentic and pure science produced in our profession to adequately fill our pages, and, second, because it would never be read if there were. You may be able by a good deal of persuasive effort in the way of coaxing and the lash to lead a horse to water, but you cannot make him drink—more than he cares to. Forced feeding of any kind tends only to stagnation, and it were better that we aim to assimilate our science in a reasonable way as we go along, particularly in view of the fact that so 'many of the facts that we have found out are not so.'

"Above all things, let us strive for balance in our deliberations and in our literature. Let us be generous, let us be charitable, let us be consistent, but do not let us pursue the foolish policy of advocating a lot of measures that are wholly impractical just because we have become obsessed with an itch for criticism based on ignorance of the real essence of the situation or the real needs of the profession."

Quotations on the Status of Dentistry (continued)

The term "medicine" originally meant to remedy or cure. ["*Medicina* (ars)"—healing art; "*medicina* (res)"—a remedy; "*medicus*"—of healing; also a physician.] Today "medicine," by including measures to *prevent* sickness and by throwing *etymology* overboard, means not only to remedy or cure, but also *quite the contrary*—to make remedial or curative treatment unnecessary. As medical knowledge has advanced and medical procedures have been changed in consonance, including the development of prevention and of surgery, new meanings have been imparted to the term "medicine." But instead of replacing "medicine" by a succession of words intended to indicate *etymologically* the broader or deeper modern meanings, the import of the original term has been conveniently enlarged as the scope of medical practice has expanded. Thus, the term "medicine" has come to mean more and more as *physicians*, without restricting themselves to its *etymology*, have included *more and more in its significance.* Along the same line of reasoning one sees clearly that, although *etymologically* the term "dentistry" refers only to the teeth, nevertheless logically it also comprehends the contiguous parts and their systemic relationships. Certainly by *usage* in conformity with this logic, and also with the criteria of common sense, the term "dentistry" has *acquired* the broader meaning suggested by the more detailed and lengthy term "oral health-service." By logic, usage, and convenience, the term "dentistry" has thus become the *practical* equivalent of "stomatology," which *etymologically* means the sum of scientific knowledge concerning the mouth, but *etymologically does not include the rest of the body* (although "stomatology" is now *used* by some to include systemic relationships with the mouth). This being true, we are unable to agree that "dentistry" and "dentists," which are terms that have long represented the earnest and aspiring endeavors of generations of faithful practitioners of oral health-service, should be formally replaced for *etymological* reasons by "stomatology" and "stomatologists."—*American College of Dentists*, March, 1929.

The New York Academy of Dentistry . . . without any diminution of its abiding purpose to promote intimate association and cooperation between dentists and the practitioners of all other kinds of health-service, believes that, in the interest of the patient, dentistry should be *continued* as a separately organized profession, based on systems of ethics, education, jurisprudence, and journalism that will fully meet all public needs at each stage of its evolution.—*N. Y. Academy of Dentistry, April, 1929.*

The Dental Society of the State of New York . . . expresses the earnest conviction . . . that the most effectual development of oral health-service will be insured by the *continuance* of dentistry as a separately organized profession . . . [and] also records its unabated desire and intention to promote personal and professional accord, cooperation, and mutual helpfulness between dentists and the practitioners of medicine and all other kinds of health-service.—*Dental Society of the State of New York, May, 1929.*

Important Books Received

The teeth, the bony palate, and the mandible in Bantu races of South Africa. By J. C. Middleton Shaw, M.A., B. Dent. Sc. (Dub.), D.D.S. (Johannesburg), F.I.C.D., Professor of Dental Science; Dean of the Faculty of Dentistry; Director of the Dental Hospital; and Lecturer in Dental Anatomy, Physiology and Histology, University of the Witwatersrand, Johannesburg, South Africa. With a foreword by Sir Arthur Keith. (Thesis approved for the D.D.S. degree in the University of the Witwatersrand.) 1931: pp. 134; 7½ x 4½ in.; 54 illustrations; 12s. 6d. John Bale, Sons and Danielsson, Ltd., Oxford House, 83 Gt. Titchfield St., London, W. 1, England.

Impressions for the semi-dentulous mouth. By T. N. Scott, D.D.S., B.Sc. (Dent.). 1930: pp. 40; 7½ x 4½ in.; 17 illustrations. Faculty of Dentistry, University of Toronto, Toronto, Canada.

Estudios sobre el fluor y la fluorosis experimental. By Dr. Juan Chaneles, Adscripto a la catedra de Terapia e Higiene de la Escuela de Odontologia, Buenos Aires, Argentine. 1930: pp. 146; 8½ x 4⅝ in.; 43 illustrations. Talleres Gráficos Ferrari Hnos., Buenos Aires, Argentine.

An improved ceramic technique involving the wax expansion principle. By R. L. Currie, D.D.S. 1930: pp. 40; 7 x 4½ in.; 2 illustrations. Faculty of Dentistry, University of Toronto, Toronto, Canada.

Bulletin of the Massachusetts Department of Mental Diseases; Fernald Memorial Number. Edited by George M. Kline, M.D., Douglas A. Thom, M.D., and George L. Wallace, M.D. 1930: pp. 258; 7½ x 4 in.; 15 illustrations. Commission on Administration and Finance.

La pratique stomatologique. VII. Orthodontie. By G. Izard, Professeur d'Orthodontie à l'Ecole Francaise de Stomatologie; Stomatologiste des Hôpitaux de Paris. 1930: pp. 762; 6¾ x 3¾ in.; 714 illustrations; broché, 95 fr., relié, 110 fr. Masson et Cie, Paris, France.

Dentures et dentiers complets. By F. Ackermann, Ancien chef démonstrateur du Professeur Gysi, Université de Zurich; ancien assistant à l'Institut Dentaire et à la Faculté de Medicine de Genéve. 1930: pp. 538; 7½ x 4¾ in.; 538 illustrations; broché, 135 fr., relié, 150 fr. Masson et Cie, Paris, France.

Orthodontic laboratory manual. By George M. Anderson, D.D.S., Professor of Orthodontia, Baltimore College of Dental Surgery, University of Maryland, Baltimore. 1930: pp. 56; 7 x 4½ in.; 23 illustrations; $2.00. C. V. Mosby Co., St. Louis, Mo.

INTERNATIONAL ASSOCIATION FOR DENTAL RESEARCH

Meetings in 1930–31

SECTIONS. *Ann Arbor:* June 11. *Boston:* January 26, May 14. *Chicago:* October 16, Janua 8, February 1, April 30. *Cleveland:* March 9. *Halifax:* November 28, February 28, April 24. *Minn sota:* October 27, November 24, January 26, March 30, April 27. *New Haven:* February 12. *N York:* December 10, May 21. *Philadelphia:* October 13. *Pittsburgh:* November 3, December 1, Ja ary 5, February 2, March 2, May 18. *St. Louis:* December 23, January 13, April 14. *Toronto:* Fe ruary 5.

ASSOCIATION: Ninth general meeting, Memphis, March 21–22, 1931.

All persons interested in dental research are invited to attend the scientific meetings of the Sections a of the Association.

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THE JOURNAL OF DENTAL RESEARCH is dedicated to the advancement of research, and to t dissemination of knowledge, pertaining to the teeth and mouth and to their relations to the body a whole. It publishes original investigations and reviews in these fields, and in the sciences allied w or applied to them. Issued bi-monthly, at the *ends* of the months of February, April, June, Aug October and December, each volume contains at least 600 pages, for which the subscription price is $5

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WAVERLY PRESS, INC.
BALTIMORE, U. S. A.